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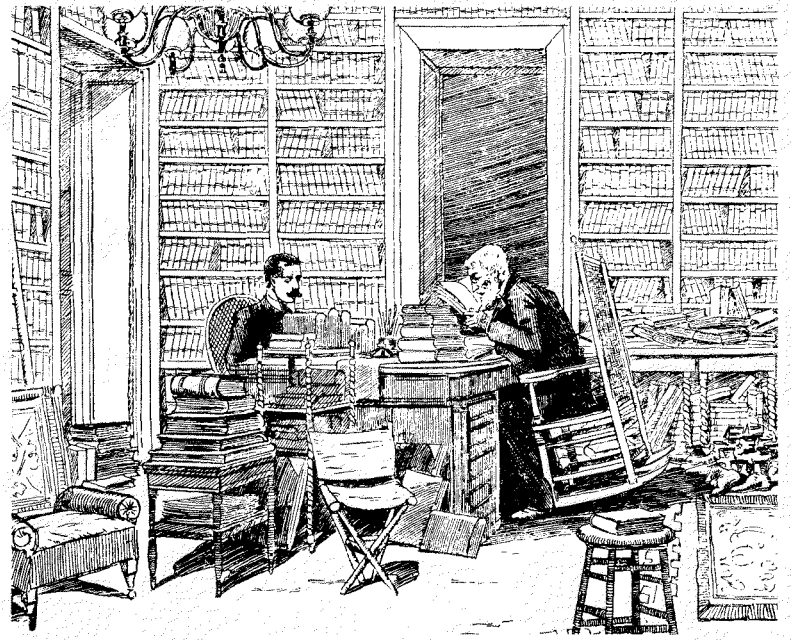

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About this issue . . .

We are grateful to two leading creationists who have made contributions to this issue.

The first is Dr. Norman Geisler. You may recall his participation in an earlier debate on the concept of design in nature, which began with issue XIII and continued through issue XXIII. Then, in issue XXIII, there appeared an article by Tom McIver that showed how creationists had misquoted Clarence Darrow in support of their own cause. One such creationist was Dr. Geisler. So, in these pages, Dr. Geisler acknowledges the error and adds new information to further set the record straight. However, in his final four paragraphs, he adds arguments as to why Darrow was wrong in the position he actually took. Some of these arguments have been answered in previous issues of *Creation/Evolution*, so we felt that no rebuttal was necessary in this one. Other arguments are effectively answered in the article by Stanley Rice that immediately follows.

The second leading creationist to contribute to this issue is Dr. Walter T. Brown, Jr. He is a participant in a written debate with Jim Lippard which covers a number of arguments. We expect this spirited exchange to continue into future issues of *Creation/Evolution.*

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Debunking New Myths

Michael Zimmerman

As is so often the case, the more frequently a story is told, the more likely it is to be accepted as fact. Creationists are particularly adept at practicing this mode of persuasion. For example, claims that the second law of thermodynamics makes evolution impossible have been repeated so loudly and so often that vast numbers of scientifically illiterate people have come to accept this as fact. Similarly, large numbers of people have been led to believe that the gaps in the fossil record pose an insurmountable problem for evolution and that hordes of perfectly reputable scientists no longer accept evolution as fact.

While it is difficult to combat such patently ridiculous ideas once they have become established, it is imperative that those of us who care about science education continue the fight. Given that it *is* awfully difficult, in the Kuhnian sense, to overturn even absurd paradigms once they have become established, it is even more important that we combat creationist myths in their earliest stages. With this in mind, I would like to point out two new stories that have the potential, if we are not careful, to be elevated to the status of myth. Both of these stories are easy to debunk at this stage, and, by so doing, we gain the additional advantage of demonstrating the embarrassing state in which "creationist scholarship" finds itself.

Mystery Testimony

The first myth is being advanced by televangelist Dr. James Kennedy. In talks and on videotapes, he has presented his own view of the Scopes trial—a view that has remarkably little basis in reality. An article entitled "Evolution's Bloopers and Blunders," written by Kennedy in the March 1987 issue of *Bible-Science Newsletter*, is reasonably representative of his ideas. In that article there is a section entitled "Scopes Trial." The first paragraph of that section reads:

> There was, of course, the famous Scopes Trial. Most people do not realize it but a most damaging piece of testimony came about when Clarence Darrow

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> put William Jennings Bryan on the stand. Darrow, who was an atheist and an evolutionist, asked Bryan if he realized that in his home state of Nebraska there had lived a whole race of men a million years ago. Bryan said he didn't realize anything of the sort and he didn't believe it either. So Darrow brought in Dr. Henry Fairfield Osborn of the American Museum of Natural History, the most respected paleontologist in America at the time. He testified that just three years prior, in 1922, evidence of a whole race of men had been discovered to have lived in Nebraska a million years ago. Bryan was dumbfounded.

The myth being promoted here is that the only reason Bryan was humiliated during the Scopes trial was because Darrow and Osborn resorted to a reference to the soon-to-be-discredited Nebraska Man. In fact, Kennedy's "history" is just plain wrong.

Quite simply, Henry Fairfield Osborn never testified at the Scopes trial. He was not even on the list of scientific witnesses that the defense team organized. The front page of the *New York Times* for July 14, 1925, has a boxed article entitled "List of Scientists and Ministers to Aid Scopes if Evidence Is Admitted on Evolution and the Bible." This article begins with the statement: "The complete list of witnesses for the defense in the Scopes trial called so far and who are either here or on the way was announced today as follows. . . ." The article goes on to list the names, positions, and affiliations of fifteen people; Osborn is not among them. The article does conclude by saying:

> The defense counsel said it had more witnesses in reserve who might be called if Judge Raulston would consent either to permit scientific evidence to be presented to the jury or him alone to aid him to decide on the motion to quash because the theory of evolution does not conflict with the Bible.

This last sentence is of importance to the thesis of Kennedy's article because, in 1925, the use of expert witnesses was not nearly as common as it is today. Late in the day on July 15, 1925, the defense called and questioned Dr. Maynard Mayo Metcalf, a biologist from Johns Hopkins University. (My present affiliation requires me to point out that Dr. Metcalf previously taught at Oberlin College and that many newspaper reports of the time simply say that he was from Oberlin.) After some testimony, the state challenged the legitimacy of expert testimony in the case, and court adjourned. On July 17, 1925, Judge Raulston ruled that no further expert testimony would be allowed but that the scientific witnesses would be permitted to submit written affidavits. Osborn, incidentally, was not among the scientists who submitted written testimony. (Quite as an aside, it is interesting to note that John Washington Butler, the legislator who authored the "Scopes Law," was upset that certain testimony would be limited. The *New York Times* on July 18,

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1925, ran a front-page subheading saying that Butler "Regrets Barring Scientists, Declaring Evidence Would Be a 'Right Smart' Education.")

It was frustration stemming from the fact that the scientific case of the defense was dismissed without hearing that led defense attorney Arthur Garfield Hays to call Bryan to the stand. Kennedy implied that the most damaging testimony centered on the existence of Nebraska Man. Again, the *New York Times* is a useful source. The July 21, 1925, issue devoted almost three-quarters of a page (of very small print) to "The text of the salient points in Mr. Bryan's testimony in reply to Mr. Darrow's questioning on the stand in the Scopes trial today." Nebraska Man was not mentioned once in the testimony reproduced by the *New York Times*. The front-page headlines focused the reader's attention on a number of points: "Bryan Fixes Flood's Date and Defends Jonah and Joshua. *Admits Some Allegories.*" Bryan quite clearly said, for example, that he did not believe that the days mentioned in the Bible were twenty-four-hour days, although he also claimed that Noah's flood took place in 2348 BC. Court was adjourned for the day with the conclusion of Bryan's testimony. The trial concluded the following day with the defense team accepting conviction and without the opportunity for closing remarks on either side. There obviously was no opportunity for Henry Fairfield Osborn to "dumbfound" Bryan.

This example of shoddy scholarship is particularly important because there can be no doubt about the facts of the Scopes trial. The issue is not one of interpreting complex or controversial data; Kennedy is just plain wrong. His revisionist history attempts to place Bryan in the best possible light while at the same time imply that the issue of Nebraska Man was in some way central to the case for evolution.

Open and Shut Minds

The second attempt by the creationists to champion a grossly inaccurate myth is also easy to refute. This example deals with the willingness of the scientific community to undertake critical investigations. On pages seven through ten of the August 1988 *Bible-Science Newsletter*, contributing editor Nancy Pearcey conducted an interview with Ian Taylor. On page eight, there is a section entitled "Queer Bird" that deals with *Archaeopteryx*. The implication in the early portion of this section is that the publication of Darwin's *On the Origins of Species* led to rampant speculation about what an intermediary between a bird and a reptile might look like and that this speculation almost immediately led to the fabrication of fossils of *Archaeopteryx*. Conveniently ignored in this scenario is the fact that the first *Archaeopteryx* fossil was found in 1855, four years prior to the publication of *Origins of Species*.

But I consider this point only a trifling mythette. The full-scale myth that the creationists would like to perpetuate occurs in the final paragraph of the section. This paragraph is set up by reporting that Sir Fred Hoyle believes "that the *Archaeopteryx* fossils are really fossils of a small dinosaur called a *Compsognathus*, with

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feather impressions stuck on by a forger." The final paragraph then goes on to say:

> Since Sir Fred Hoyle published his finding of the *Archaeopteryx* fossils, the British Museum has closed off all further investigations of its specimen—an instructive example of the open, scientific attitude. Interestingly, neither Darwin nor Huxley nor any of the other early evolutionists accepted *Archaeopteryx* as a genuine transitional fossil. Maybe they knew something modern evolutionists don't know.

The point is, however, that the British Museum did no such thing. A large-scale study, using a variety of techniques, was conducted by the British Museum staff *after* Hoyle and his coworkers made their charge of forgery. The results were published by A. J. Charig, F. Greenway, A. C. Milner, C. A. Walker, and P. J. Whybrow in the May 2, 1986, issue of *Science* ("*Archaeopteryx* Is Not a Forgery," 232:622–625) over two years *before* the Taylor interview in *Bible-Science Newsletter* was published.

I would have no problem whatsoever had Taylor decided to criticize the study or to disagree with its conclusions or methodology. Such disagreements are, after all, what science is all about. But for Taylor to say that no such studies were ever conducted and that the British Museum refused to permit such studies is an outright error. Sure it makes for a better story to say what Taylor said—but it just isn't the truth.

These two examples are a fair representation of the state of "creationist scholarship," and proponents of scientific literacy should not be timid in pointing this out. If these developing myths are not debunked early, they may, in the not-too-distant future, come to be accepted as fact by an uninformed public.

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Was Clarence Darrow a Bigot?

Norman L. Geisler

Darrow's Famous Bigotry Quote Is Not Authentic

I wish to commend Tom McIver for exposing the questionable authenticity of the widely used quote attributed to Clarence Darrow, "It is bigotry for public schools to teach only one theory of origins" (McIver, 1988). Wendell Bird, whose *Yale Law Review* article (1978) was the source of many of the citations, has subsequently recognized that the quote is probably not authentic. So much for trusting Ivy League publications!

I believe, also, that McIver should be commended for revealing another misquotation of Darrow. It is clear that Darrow did not believe that creation was scientific. Thus, when he declared at the Scopes trial that children should have "both" creation and evolution, he meant both "evolution" (which is science) and "creation" (which is theology). This fits not only with his whole argument at the trial but also with what he said a few years later when he declared, "In fact, there is no other theory to teach regarding the origin of the various animal species, including man" (Darrow, 1932).

Darrow Did Level the Charge of Bigotry at Creationists

However, there are some interesting things brought into focus by the McIver article that should not pass unnoticed. Darrow did believe that passing and defending the Tennessee creation law was "bigotry."

Darrow used the words *bigotry* or *bigot* numerous times during the trial. In fact, they are used six times on only two pages of the trial transcript (Hilleary and Metzger, 1925). For example, when Bryan stated on the witness stand, "I am perfectly willing that the world shall know that these gentlemen have no other purpose than ridiculing every Christian who believes in the Bible," Darrow re-

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sponded, "We have the purpose of preventing *bigots* and ignoramuses from controlling the education of the United States and you know it, and that is all" (p. 299; emphasis added). In another place, Darrow argued:

> Unless there is left enough of the spirit of freedom in the state of Tennessee, and in the United States, there is not a single line of any constitution that can withstand *bigotry* and ignorance when it seeks to destory the rights of the individual; and bigotry and ignorance are ever active. [p. 75; emphasis added]

He even refers to Thomas Jefferson, asking:

> Can a legislative body say, "You cannot read a book or take a lesson, or make a talk on science until you first find out whether [what] you are saying [is] against Genesis . . ."? It could—except for the work of Thomas Jefferson, which has been woven into every state constitution of the Union, and has stayed there like the flaming sword to protect the rights of man against ignorance and *bigotry*. . . . [p. 83; emphasis added]

At another point Darrow appealed to the judge:

> Your honor knows that the fires that have been lighted in America to kindle religious *bigotry* and hate. . . . You know that there is no suspicion which possesses the mind of men like *bigotry* and ignorance and hatred. [p. 87; emphasis added]

Even the lawyers opposing Darrow took note of his use of the word *bigots*, saying, "They say it is sponsored by a lot of religious bigots. Mr. Darrow said that, substantially that" (p. 197).

These citations leave no doubt that Darrow believed that those who produced, promoted, and defended the Tennessee anti-evolution law were bigots for denying the right to teach evolution in the public schools, even though creation was not being taught. In this connection, it is interesting to observe precisely what Darrow himself was promoting to see if, perchance, the charge of bigotry is a double-edged sword.

What the Evolutionists Were Defending

According to McIver, and I believe he is right, "Darrow was challenging the law in order to allow the teaching of evolution" (McIver, 1988). Yet, he acknowledges that "the Dayton public schools were only teaching one view—evolution—and that was what Darrow was trying to defend" (p. 9). If so, then Darrow's plea, "Let them have both. Let them both be taught," comes up a little hollow. For he certainly

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was not advocating that the Genesis account be taught in public schools, even as theology. Darrow was categorically opposed to teaching religion in the public schools.

Furthermore, Darrow's reference to Jefferson is infelicitous, since he believed that "all men are created" and even referred to a creator in the Declaration of Independence. Jefferson would certainly be surprised to return to the United States today and find that Darrow and the evolutionists have declared it unconstitutional to teach the truths of the Declaration of Independence in public schools. Jefferson himself set up a department of divinity in his state-supported University of Virginia and signed into law a treaty with the Kaskasia Indians to pay a Catholic missionary to do mission work with them (1803).

In addition, it seems to me that McIver's claims that only evolution is scientific—and that creation is religious—is a form of definitional bigotry. For if creation is not scientific, then most of the major scientists between 1620 and 1860 were not scientific when they said that scientific evidence points to a creator. Sir Isaac Newton, for example, declared:

> It is not to be conceived that mere mechanical causes could give birth to so many regular motions. . . . This most beautiful system of the sun, planets, and comets could only proceed from the counsel and dominion of an intelligent and powerful Being. [Newton, 1686]

As we have shown elsewhere, creation is just as scientific as macroevolution (Geisler and Anderson, 1987). Of course, neither creation nor macroevolution is an *empirical* science. That is, no one observed the origin of the universe, and it is not being repeated today. However, both creationist and evolutionist views are "scientific" in the sense of *forensic* science. They are simply speculative reconstructions of past unobserved events on the basis of the remaining evidence.

Now it seems to me to be a form of epistemological bigotry to argue that we can allow public school science teachers to speculate only about possible natural causes but not about possible intelligent causes. By this same logic, archaeologists are not scientific when they posit an intelligent cause for ancient pottery. Both archaeologists and anthropologists cease to be scientists when they assume that arrowheads were made by Indians. Maybe Darrow did not say it, but in view of this I will: "It is bigotry for public schools to teach only one theory of origins!"

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"Faithful in the Little Things": Creationists and "Operation-Science"

Stanley Rice

> His master said to him, "Well done, good and faithful servant; you have been faithful over a little, I will set you over much. . . ." [Matthew 25:21]

All readers of *Creation/Evolution* are aware that creationists of the young-Earth, global-flood camp have received heavy criticism from scientists. These creationists usually attribute the criticism they receive to an anti-supernaturalistic bias on the part of scientists. And it cannot be denied that this has been one significant source of criticism. Therefore, the report by Scott and Cole (1985) that these creationists do not publish their creationist theories in standard journals is hardly surprising. But is this the only reason creationists have received such heavy criticism?

No, for two reasons. First, many scientists have a Christian, even conservative Christian, commitment and yet criticize the creationists (for example, Ramm, 1954; Vawter, 1983; Gilkey, 1983; Hyers, 1983, 1984; Young, 1982). Many prominent scientists have openly indicated their belief in God, including David Lack, the famous ornithologist (1957); Arthur Peacocke, dean of Clare College at Cambridge (1979); and Frank Salisbury, a plant physiologist (1976).

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Second, it is not just creationist theories but even the everyday, routine, noncontroversial research done by creationists that have received criticism (Hitt, 1987). For instance, only a creationist would want to prove that the seeds of all extant plant species would have been able to survive the kind of prolonged exposure to salt water that would have occurred during Noah's flood. But creationist beliefs should not prevent a botanist from being able to design a perfectly adequate experiment in which salt water tolerances of various seeds are tested. Only a creationist would propose that salt and fresh water might have remained separate during a global deluge. But creationist beliefs should not prevent an earth scientist from competently designing a microcosm to investigate the mechanism that might have allowed such a separation. Only a creationist would propose that even microevolution cannot occur in natural populations. But creationist beliefs need not prevent field biologists from competently investigating changes in gene frequencies in natural populations. To use the terminology of Geisler and Anderson (1987), creationists can expect hostility in response to their "origin-science," but they should be able to adequately carry out "operation-science."

In reviewing some creationist operation-science, I will demonstrate a very interesting phenomenon: creationists, although capable of doing adequate operation-science, generally do not. The explanation of this phenomenon ought to help creationists improve their act and critics understand them better.

Creationist Plant Physiology

George F. Howe, professor and chairperson of the Division of Natural Sciences at Los Angeles Baptist College, demonstrated that he was capable of doing competent scientific research when he published his Ohio State University thesis research on plant physiology. When I met him in 1976 and corresponded with him in 1982, I saw no reason to suspect him as a less-than-compentent scientist. However, he undertook an investigation of the survival of plant seeds under supposed global flood conditions which has considerably marred this image of competence (*see* Howe, 1968).

Creationists generally believe that all of the "kinds"—whether species, genera, or families—of plants existing today were created "in the beginning" and, therefore, had to have survived the flood as seeds or resprouted from floating branches or underground organs *in situ*. A creationist prediction would be that all surviving plant species can tolerate, in some manner, the brackish water that would have resulted from the mixture of oceans with forty days of rain. A plant physiologist cannot, of course, test the salt tolerance of all plant species; instead, the physiologist should select representative samples of plant species from a variety of growth forms (trees, shrubs, herbs), taxonomic groups (mosses, ferns, conifers, monocots, dicots), life cycles (annuals, perennials), and ecological affinities (forests, deserts,

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swamps). Unless this is done, generalizations about the plant kingdom cannot be made. Furthermore, since survival in a specific set of conditions (during the flood) is being hypothesized, the experiment should realistically simulate these conditions (for instance, churning of water and abrasion of seeds against rocks and sand).

Howe and his assistants did none of this. They began their investigation by collecting the fruits of five species of weeds in the Santa Barbara vicinity. They soaked the seeds for twenty weeks in calm sea, fresh, and brackish water. Thereafter, the seed coats were abraded to allow the penetration of water, and three of the five species germinated. Howe's conclusion was, "There is widespread resistance to salt or fresh water soaking among the seeds of flowering plants."

The results demonstrate nothing of the sort. The five species were all weeds. Weeds live in fields and vacant lots and are subjected to severe fluctuations of light, moisture, and temperature conditions. One of the species, *Rumex crispus*, has a geographical range that covers many climatic conditions. Weeds are more tolerant than most plants of environmental extremes. Weeds in the Santa Barbara vicinity have to be especially tolerant of salt resistance—more so than weeds that grow further inland. The investigation, therefore, had an inadequate sample size, and the sample was not in any way representative of flowering plants in general. (Darwin's research on the survival of seeds during exposure to sea water used eighty-seven species.) Furthermore, as pointed out by Moore (1983), how could the seeds have avoided abrasion of the protective seed coat during the flood? The survival of the seeds in salt water very likely would not have occurred if the salt water had penetrated to the inside of the seed. The use of city tapwater (perhaps chlorinated) in the experiment made the whole investigation inconclusive. Finally, the survival of three out of five species isn't bad, but how did the other two come to be with us today if they would have died in the flood?

Despite these shortcomings, the article was praised by Duane Gish in a review article, "A Decade of Creationist Research" (1975).

Creationist Hydrology

E. Norbert Smith was a professor of biology at Northeastern Oklahoma State University and has been elected as a member of the Physiological Society of America and as a fellow of the American Association for the Advancement of Science. Even some of his articles published in *Creation Research Society Quarterly* (1973) concerning planarian reproduction appears competent. Can better scientific be desired? Yet, when he undertook a microcosm simulation of supposed flood conditions (*see* Smith, 1979), you would never guess that he knew anything.

Many freshwater animals cannot tolerate salt water, and many marine animals cannot tolerate fresh water, and many animals (both freshwater and marine) cannot tolerate brackish water. Could all of the aquatic animals of today's earth have sur-

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vived a flood in which ocean and fresh water were mixed violently together? Smith proposed that aquatic animals survived the flood in isolated pockets of salt or fresh water which were not mixed together. Salt water, after all, has a higher specific gravity than fresh water. This could occur only in a relatively tranquil flood, unlike the one that most creationists believe (Clark and Voss, 1980).

Smith placed salt water in the bottom of an aquarium, with sand and a crab to make it seem realistic. Next he *covered the salt water with a sheet of paper* and carefully placed fresh water on top of it. He placed a fish in the fresh water (with a scientist's love of precision and completeness, Smith informs us it was a 4.5-centimeter goldfish). He found, to his dismay, that the fish swam around and mixed up the water. So, he repeated the experiment, this time omitting the fish. Triumphant at last, Smith made careful measurements of salinity to show that the water layers remained fairly distinct.

This investigation was obviously meaningless. What could possibly have corresponded to the sheet of paper in a real flood? And despite the paper, the experiment didn't even work the first time. Smith is certainly intelligent enough to have done a better job.

Creationist Population Genetics

Creationists reject macroevolution but usually accept microevolution. Indeed, I have heard them boast of having been the discoverers of natural selection, since Edward Blyth was a creationist (*see* Eiseley, 1959). But if they could demonstrate that even microevolution does not occur, they would be very happy.

Walter E. Lammerts knows enough about botany and genetic variability in plants to have been a prize-winning rose breeder. He and George Howe decided to investigate genetic changes in wild populations of plants in California. They chose five species of wildflowers and made repeated observations of their phenotypic characteristics over a five-year period during which drastic differences in weather occurred. The result should have been a valuable contribution to ecological literature, but it was nothing of the sort.

Their article, "Plant Succession Studies in Relation to Microevolution" (1974), is confusing enough to thwart most readers. The title itself misleads biologists into thinking it refers to changes in species composition over time, which is what *succession* generally means. Moreover, the bulk of the information is presented in tables that appear to have been copied from raw field notes. There are six pages of these five-columned tables with entries like "3/4 [inch] orange center, and 3/8 [inch] irregular yellow margin; medium large 9 [inch] plant." Sometimes they even present conclusions in their tables, such as "Great reduction of plants compared to 1969. *No types found in 1969 have increased*" (emphasis theirs). Somewhere in this mess, we are supposed to learn something about microevolution.

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Also, the authors never even state a hypothesis. If they believe that evolution is not occurring in these wild populations, then they should predict what they expect to see instead. All they do say, however, is that if evolution is true they should see "gradual shifts or evolutionary trends."

Nor does their paper clearly state their methods. I think they chose plots of land of variable size dominated by the various species of wildflowers, then chose variable numbers of individual plants which they called "selections," and labeled the locations with wire stakes within these plots. In this study of "natural selection," *they selected* "selections" from their study areas. They returned each year and recorded what they saw growing at the stakes.

They made no attempt to distinguish plant variation that is genetically based from that which is environmentally induced—which is routinely done in studies of genetic variation in wild populations (*see*, for instance, Marshall and Jain, 1968, and Wilken, 1977). Lammerts and Howe knew that some of the variability they studied had a genetic basis but could not assume that *all* of such variability was genetic.

Then they proceeded to gather data. They had an exciting time of it, including some "real shockers," as they put it. A three-year drought occurred during their study. Before the drought, their California poppy study area had about a thousand plants, only 3 percent of which were orange-flowered, the others being yellow. The plants disappeared during the drought. Then, when the rains returned, Lammerts and Howe were for some reason surprised that only three hundred plants grew back, as if this fact cast doubt on microevolution. It was indeed interesting that almost all of the post-drought poppies had orange flowers. I do not understand how they concluded from this that "no types present in 1969 have increased"; indeed, it looks like they might have caught microevolution in the act.

They were not satisfied, however, that evolution might have really occurred. The change from predominance of yellow to orange flowers in the population seemed to them to be too quick. They expected to see, if evolution is true, a more gradual change from one year to the next (even if the plants all died). In another species, they noted that a certain phenotype "did not *gradually increase* during the dry . . . seasons" (emphasis theirs). It did increase, but not gradually. To them, only extremely gradual changes qualify as evolution.

Furthermore, it appears that phenotypic variation in the populations was reduced during the drought. To Lammerts and Howe, this was evidence against microevolution. When they concluded that "natural selection does not originate variation, but *severely restricts* it" (emphasis theirs), most evolutionists would agree, after appending the word *sometimes*. The authors claimed that their data showed that natural selection will "bring populations back to a typical or normal form," but they could not say how to define the norm. To them, if variation does not increase, evolution is not occurring.

Lammerts and Howe also indicated that, because the putative genetic changes

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they observed were not consistently directional, evolution was not occurring. However, it was *orthogenesis*, the mysterious upward-impelling vital force of Teilhard de Chardin and Henri Bergson, that was not occurring. Meanwhile, evolution may have been doing just fine. Moreover, the authors, although first admitting that five years was too short a time to study even microevolution, proceed to ignore their own warning and conclude that their data discredit microevolution.

Finally, Lammerts and Howe made no effort to determine the extent that their observations might have been influenced by gene flow (transport of pollen and seeds into or out of their study areas).

Despite all of these shortcomings, both theoretical (in their conception of microevolution) and practical (in the writing of the paper itself), some creationists consider this to be landmark research. Gish praised it (1975), and the editor of *Creation Research Society Quarterly* even asked Lammerts to publish the results all over again ten years later (1984).

Conclusions

How could scientists who have demonstrated their competence publish such awful pieces of research as those I have described here? I believe it is because their anti-evolutionary zeal gets the better of their judgment. They seem to grab at anything that can be made to even slightly agree with young-Earth, global-flood creationism, or to cast any doubt upon evolution, and rush it into print. They make errors that they would not make under calmer circumstances. They have not been consistently faithful in the slow work of scientific research.

When T. H. Huxley discovered that what he had thought to be *Bathybius haeckellii*, the primordial organism, was just calcium carbonate precipitate, he retracted his conclusion (Gould, 1980). When will the creationists admit that they have been hasty in their conclusions? It is not always thoroughness of data collection that creationists lack: witness the huge tables of data in the Lammerts and Howe article and the 807 references in an article by creationist John Woodmorappe (1983). Consistent faithfulness in routine scientific research requires careful thought about the data.

Perhaps the future is brightening for the creationists. Students for Origins Research publishes a newspaper which is remarkably free of the kinds of sloppiness found in past years in *Creation Research Society Quarterly* (Schadewald and Patterson, 1985). And even the latter publication may be improving. I hope the creationists accept this critique as a challenge to improve their work. If they want the respect of the scientific world—even if there is no hope that they can obtain our agreement—then they must be "faithful in the little things."

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Comparing Darwin's Method with That of Scientific Creationists

M. L. Anderson

In spite of the overwhelming evidence against it, scientific creationism is a growing movement (Numbers, 1982). Numerous authors (for example, Kitcher, 1982; Futuyma, 1982; Godfrey, 1983, 1984; Montagu, 1984) have argued that scientific creationists use questionable tactics to achieve this success. Creationists have been accused of distorting the evidence, misrepresenting evolutionary scientists, and being ignorant of both evolutionary biology and the philosophy of science.

In answering creationists, it is understandable that we should want to use the latest facts that research has put at our disposal. Yet, curiously, in doing so we may be playing into their hands. This sounds very strange, so let me explain.

What we would be doing is admitting to the tacit assumption that debate simply hinges on what the facts are. This would be a mistake, I think. As important as the new facts are, they are not needed to show that evolution is superior to scientific creationism. There was enough evidence in Darwin's day. What is needed is clear thinking. Darwin displayed this. I will show that creationists don't.

Indeed, one of the tactics of creationists is to dazzle with carefully chosen facts and to couch their arguments in such highly technical language that the fallacies in their thinking are often obscured. My aim here is to show that creationists make apparent headway with their arguments because they conflate three distinct types of evidence. To demonstrate their fuzzy thinking, it will be helpful to consider an illustration.

In Figure 1, facts are represented by dots on a graph (*see* page 16). Hypotheses are represented by curves. If we were given only E_1 and E_2, there would be no way of knowing which is the better hypothesis, H_1 or H_2. Since E_1 and E_2 are common to both hypotheses, let's call this evidence *common evidence.* To determine which is the better hypothesis, we need a different kind of evidence. This second type we will call *discriminatory evidence* (E_3 and E_4). Given this new

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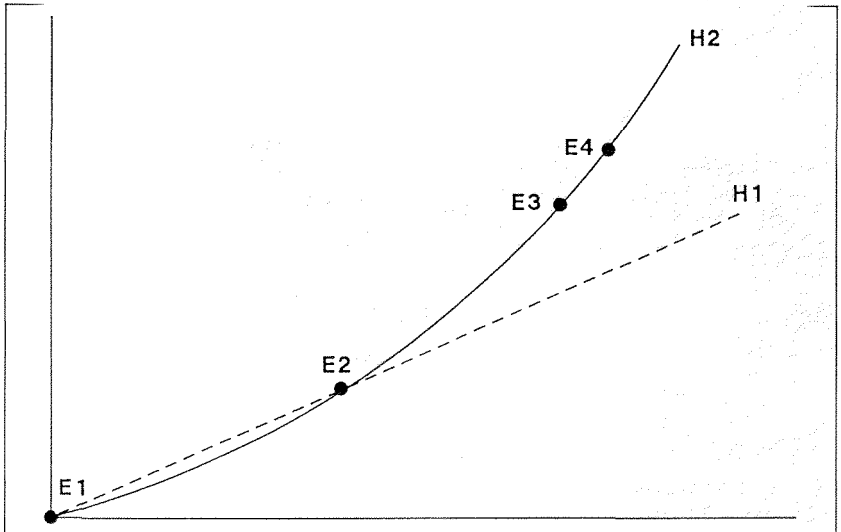

Figure 1
Concepts of Evidence

evidence, we can easily see that H_2 is superior to H_1. The discriminatory evidence (E_3 and E_4) has decided the issue and is therefore an important and distinct type of evidence. Anderson (1987) defines these two types of evidence as follows: *common evidence* is that kind of evidence which is equally favorable to two or more hypotheses, and *discriminatory evidence* is that kind of evidence which tends to favor one hypothesis over its rival.

Have we proved that H_2 is the correct hypothesis? No, not in any ultimate sense. But we have shown that H_2 is the better of the two alternatives. To create the impression that H_1 is equally acceptable as a scientific hypothesis, one might use the following tactics.

Tactic One

One could belabor the point that there exists evidence which is actually common to both alternatives and which precisely fits one's theory. Of course, it is of no consequence that E_1 and E_2 precisely fit H_1; it is the remaining evidence which is critical. This is a species of a well-known fallacy called *special pleading*. Creationists commit this fallacy, as the following examples will show.

The first example of creationist special pleading is their use of apparent design. Apparent design is evidence which is common to both evolution and creation. Evolution accounts for design through natural selection acting on heritable variation.

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Scientific creationism claims that design is evidence of special divine intervention. As both alternatives account for design, this is common evidence, and we cannot rely on it. Yet, this is exactly what creationists do. For instance, Coppedge writes: "There is no way chance mutations could have brought about the development of feathers. Each is a masterpiece of engineering" (1977, p. 215).

Of course, according to evolutionary theory, it is not chance mutations that bring about development but natural selection (a powerful anti-chance force) acting upon variability. Even this is a very simplified picture. That apparent design can be accounted for by evolutionary theory is very well attested to. The dark form of the moth *Biston betularia* is camouflage against the dark polluted bark of trees. The "camouflage design" is apparent and is merely a result of selection instead of the pale form. Therefore, as Cracraft points out: "Creationists should not invoke common design because . . . statements about functional design . . . are consistent with evolution as well" (1983, p. 176).

Similarity in living organisms is another example of common evidence used in creationist special pleading. For evolution, this similarity suggests common ancestry. For scientific creationism, this similarity suggests a common blueprint. Because both alternatives can account for similarity, we cannot rely on this evidence. Creationists frequently do. For example, Wilder-Smith writes: "Darwinism postulates that similarities in living organisms predicate common ancestry" and adds that this similarity might "be better explained on the basis of a common plan or planner behind them" (1974, pp. 52–53).

A third example of common evidence used in creationist special pleading is sterility in hybrids. According to evolution, sterility is a byproduct of constitutional differences between hybrids. Creationists can also explain sterility, as Darwin notes: "The view generally held by naturalists is that species, when intercrossed, have been specially endowed with the quality of sterility, in order to prevent the confusion of organic forms" (1859, p. 264). Since both alternatives can explain sterility, we should not rely on this line of evidence, as creationists did in Darwin's day.

Tactic Two

Let's return now to our illustration. We noted that H_2 is the better hypothesis. The second tactic which could be used to create the impression that H_1 is an acceptable scientific hypothesis is to gloss over or play down or try to explain away the discriminatory evidence. Once more, we find creationists doing this.

One example of discriminatory evidence is the imperfection in living things. If living things were specially created, we would expect them to be perfectly designed, and they are not. Whereas Darwin focused on the lack of fit between organism and environment (1859, pp. 216–217), creationists are revealingly silent about such imperfections in living things—for example, the webbed feet of upland

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geese, the absence of webbed feet in subaquatic thrushes, and the makeshift semi-opposable thumb of the panda (Gould, 1980, pp. 20–23). Coppedge (1973) and Frair and Davis (1983), for instance, completely ignore the imperfections in living things.

Another example of discriminatory evidence is the fact that the similarities in organisms form a hierarchical pattern. Creationists cannot account for this pattern, but it is easily explained through evolutionary descent, as Cracraft has pointed out:

> The hierarchical pattern produced by the shared similarities observed among organisms is predicted by a hypothesis of evolutionary descent with modification but not by an assumption of special creation. [1983, p. 172]

> To my knowledge they [scientific creationists] have never denied the existence of a hierarchy of similarity, nor have they provided a credible, scientific explanation as an alternative to descent with modification. [1983, p. 177]

A third example of discriminatory evidence is that the sterility of organisms is in degrees. Darwin states it well: "We see the truth of this conclusion" (that sterility is incidental on constitutional differences rather than a special endowment) "in the vast difference in the result, when the same two species are crossed reciprocally . . ." (1859, p. 436). Darwin did not invoke sterility as such in his defense of descent by modification; he realized that it was common evidence. Instead, he appealed to the fact that sterility between organisms is in degrees. Under special creation, one would expect absolute sterility between species, irrespective of organism and the direction of the cross.

Creationists try to explain away evidence that discriminates against their position by using ad hoc modifications of their hypothesis. There is the undisputed fact of the sequence in the fossil record of increasing numbers of more complex organisms. Creationists try to get around this evidence by positing a global flood. Whitcomb and Morris give three sorting mechanisms purportedly explaining the fossil sequence (1961, pp. 273–274), all of which involve flood geology. One is *hydrodynamic sorting*—the idea that denser and more streamlined objects would have descended more rapidly and should be found in the lowest rock strata. Another is *ecological sorting*—the idea that the inhabitants of low regions would be overcome first by the flood waters and would be in the lowest strata. The third mechanism they propose is *anatomical sorting*—the idea that the least mobile animals would have succumbed first to the ravages of the flood and would be in the lowest strata.

The problem with these three hypotheses is that they are mutually incompatible and false. Gould (1983) points out that the fossil record contradicts them. Whales, which are streamlined and marine, are found only in the upper strata, contradicting both the first and the second explanations. Sloths, which are not known for their mobility, are also found only in the highest strata, thus contradicting the third explanation.

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Tactic Three

Returning once again to our original illustration, let's look at one more tactic that someone could use to give the impression that H_1 is an acceptable scientific theory.

The "straight-liner" could claim that the incompleteness of the data for H_2 constitutes evidence for H_1. This claim makes at least three mistakes. First, it assumes that H_2 and H_1 are the only two alternatives. This is a fallacy in itself and goes by the name of the *faulty dilemma.* Second, the demands of the straight-liner are unreasonable. The straight-liner gives the impression of being very rigorous in requiring that the supporter of the exponential curve fill in the gaps. But it is easy to see the inconsistency. With regard to completeness of evidence, H_1 is worse off. The principle violated is that hypotheses should be compared over equivalent domains. For the given set of coordinates, H_2 is superior to H_1. Third, the straight-liner claims that the issue is the *amount* of evidence when, in fact, it is the *kind* of evidence that is critical. Very little discriminatory evidence is needed to favor one hypothesis over a rival. If E_1 through E_4 are the only evidence we have, then E_3 and E_4 are all that is needed to tip the scales against H_1.

Incidentally, we can see here why the straight-liner's approach might have a certain appeal. It is well known that creationists take advantage of a popular misconception that real science is pure fact (Kitcher, 1982). Since evolution is just a theory, they claim that it is not really science.

This illustration helps us to see that the straight-liner's problem is not a purely empirical one. Let us imagine that additional evidence E_5 through E_8 is found. Does this evidence compel acceptance of H_2 over H_1? Not to the straight-liner, who could point out that the lines drawn between E_4 and E_5, E_5 and E_6, and so forth, are interpolations and not facts. Therefore, H_2 is not really factual and H_1 and H_2 are both unscientific. The straight-liner might say that it is quite in order to believe H_1. No amount of evidence will convince such a person. Since the curve H_2 is infinitely divisible, it can never consist of pure fact. The straight-liner's error is in holding to a discredited view of the nature of science. Popper has shown that universal statements (the bricks of scientific theories) can never be reduced to pure fact (1972, p. 36).

Creationists argue very much like the straight-liner. They start by claiming that the only two options are evolution and special creation (for example, Enoch, 1968, p. 105; Frair and Davis, 1983, p. 55). Then they say that evolution predicts a finely graded series of transitional forms instead of the gaps we find gaps in the fossil record and that, therefore, the facts speak against evolution and for special creation. This argument is not uncommon:

> It may therefore be asserted that the facts of paleontology, namely, the sudden appearance of all the invertebrates with their distinct specialization in

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> the cambrian era, and the complete absence of undisputed fossils in the precambrian rocks, and the absence of intermediate forms linking the basic kinds of animals and plants, argue more for instantaneous creation than for evolution. [Enoch, 1968, p. 55]

> One example of the scientific evidence for creation is the sudden appearance of complex fossilized life in the fossil record, and the systematic gaps between fossilized kinds in that record. The most rational inference from this evidence is seemingly is that life was created and did not evolve. [Gish, Bliss, and Bird, 1981]

(*see also* Frair and Davis, 1983, p. 56; Chittick, 1984, pp. 64–65; Gish, 1985).

Scientists have often responded to such claims by pointing out that creationists are ignorant of certain basic facts: that despite the imperfections in the fossil record (Raup, 1983, p. 158), there are Precambrian fossils (Godfrey, 1983, p. 198); that the emergence of life was only sudden on a geological time scale; and that there are transitional forms (Godfrey, 1983, pp. 198–202; Cuffey, 1984, p. 257; Burke, 1985).

I wish to emphasize that there are additional philosophical problems with the creationist arguments. To treat the problem as purely empirical is to fall into a creationist trap. They create a superficial impression that theirs is the truly empirical approach, when no amount of evidence will satisfy them. By setting up an impossible standard and putting the onus on the evolutionary scientist to meet this standard, they put the evolutionary scientist on the defensive. Our response to the creationist should not be just to display the evidence for evolution but also to expose their faulty philosophy of science.

The creationist mistake is that he or she has conflated negative and discriminatory evidence. Because it is unreasonable to demand complete evidence, negative evidence does not count against a theory. That a significant part of the creationist problem is a philosophical one can be seen from the way they treat transitional forms.

Archaeopteryx is a classic transitional form, showing both reptilian and avian features. It is interesting to note that the responses of creationists to this form are quite divergent. One objection is that *Archaeopteryx* is not a true intermediate. Creationist Baker says, "If archaeopteryx has got a fully reptilian skeleton, then it has certainly got feathers that are fully bird-like. There is no suggestion of something at the half-way stage between a reptilian scale and a bird feather, which is what an intermediate creature would be expected to possess" (1976, p. 12). This sort of objection was addressed by Darwin (1859), of course, so we won't let it detain us here.

For our purposes, a second objection is most interesting. Cousins claims that *Archaeopteryx* is not a true missing link but, rather, an aberrant bird (1971, pp. 89–99). We can dispute this interpretation, of course, but the tactic of interest to

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us here is that, when a major gradation is found, the absence of finer gradations is taken to be evidence against evolution. If such finer gradations are found, the creationist can then point to the absence of even finer gradations, and so on. Any evidence can always be explained away because negative evidence will always be available. The creationist's mistake is in giving negative evidence the status of discriminatory evidence.

Conclusion

Complete evidence is not needed to decide between rival hypotheses—only discriminatory evidence, and not much of it. There was enough in Darwin's day to decide between evolution and creationism. In order to show that evolution is superior to the type of creationism promulgated by Morris and Gish, one need only show that, as one goes further back in the fossil record, the fossil forms become progressively different from the forms existing today. That is all. One does not need to show a finely graded series with innumerable links. Special creation, in contrast, does not predict this order. To do so, all forms would be uniformly distributed throughout the fossil record—and they are not.

The superiority of evolutionary theory is evident in spite of an imperfect body of evidence for it. Darwin realized, at least to some extent, that discriminatory evidence, rather than negative evidence, is needed to adjudicate between scientific hypotheses. Ghiselin says that Darwin rejected particular explanatory hypotheses in biogeography "not because some evidence which might support them is not available, but because the facts are better explained by some contrary hypothesis" (1969, p. 42). Furthermore, we find that Darwin admitted that the fossil record was incomplete and yet was able to see that it was sufficient to favor descent by modification over independent creation (1859, pp. 291–316). He wrote:

> Let us now look to the mutual affinities of extinct and living species. They fall into one grand natural system; and this fact is at once explained on the principle of descent. The more ancient any form is, the more, as a general rule, it differs from living forms. [p. 330]

The main point is this: we do not need more new evidence to show that evolution is superior to scientific creationism. The evidence we need has been around for a long time and is even accepted by creationists. They do not deny, for instance, that the fossil record shows a sequence of simple to complex forms. What we do need is clear thinking. Whereas scientific creationists fail to distinguish between common and discriminatory evidence and between negative and discriminatory evidence, Darwin succeeded. Others have come to similar conclusions (*see*, for example, Kitcher, 1982, pp. 30–54; Futuyma, 1982, pp. 175–196). In the following

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statement, it is evident that Futuyma comes to the same sort of conclusion as mine, although he does not give the types of evidence appropriate names. He writes:

> In actuality, almost all creationist literature simply consists of attacks on evolution, rather than positive evidence for creation. To the creationists any [negative] evidence against evolutionary theory apparently constituted [discriminatory] evidence in favour of creation." [1982, p. 176]

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An Examination of the Research of Creationist Walter Brown

Jim Lippard

Dr. Walter T. Brown, who holds a Ph.D. in mechanical engineering from the Massachusetts Institute of Technology, is the director of the Center for Scientific Creation, which is based in Phoenix, Arizona. He is one of the most vocal proponents of creation science and travels the country lecturing on the subject. He is perhaps best known for his frequent debate challenges—challenges, it should be noted, that are proffered under such strict conditions as to preclude almost all potential opponents. These restrictions include the requirement that the opponent must have a doctorate and must sign a contract agreeing to limit the subject to scientific content only; no religion is to be discussed (*see* Parrish, 1987).

The main thrust of this article is not Brown's debating tactics but, rather, his scientific scholarship, as found in both his public presentations and his book, *In the Beginning: The Scientific Case for Creation* (1987). This book is sold as a reference work for Brown's seminars and is also available in an earlier version as the article, "The Scientific Case for Creation: 108 Categories of Evidence" (1983).

My initial research into Brown's claims led me to draft a five-page list of criticisms of a number of points in his book, which I sent him on January 6, 1987. His reply (dated January 22, 1987) is worth reprinting here in its entirety, for reasons that will become obvious in the course of this article.

> Dear Jim,
>
> Please accept with my compliments this latest (October 86) "draft" of *The Scientific Case for Creationism*. Frankly, there was little, if anything, in your letter of January 6th that would cause me to alter the contents of these "120 Points."
>
> You need to come to grips with one central issue, Jim. Can you find one of your science professors who is willing to debate this creation-evolution issue in writing? The debate must be restricted to science, not religion or philosophy. Both debaters would have publishing rights. If you can't, that

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should tell you something.

Sincerely,

Walter T. Brown, Jr.

Since that exchange, I have done a great deal of research into Brown's claims, consisting mainly in checking the sources he cites and investigating the issues raised.

The "Categories" of Evidence

Brown's book is subtitled "120 Categories of Evidence," which at first appears to be quite an imposing number. However, a closer inspection demonstrates that Brown has exaggerated his case. For example, a full eleven "categories" consist of evidence for the existence of Noah's ark, sixteen are a list of allegedly "unexplainable features" of the earth that Brown asserts can be explained by a worldwide flood, and five argue for the plausibility of various parts of a flood-and-ark story. Simply reorganizing Brown's points into actually distinct categories would substantially reduce their number.

Several of Brown's categories also do not meet his description of them as "categories of scientific evidence that support a sudden creation and oppose gradual evolution." Some neither support creation nor oppose evolution; for example, category three argues against the Lamarckian view that acquired characteristics are inherited. Some categories are philosophical rather than scientific; for example, category thirty-six is an argument from design to the existence of a designer. And some simply argue for the possibility of special creation; for example, category fifteen argues that similiarities between different forms of life may imply a common designer rather than a common ancestor.

The Speed of Light

I first heard Brown speak at a meeting of Campus Crusade for Christ at Arizona State University in November 1986. At that lecture, Brown made reference to creationist Barry Setterfield's claim that the speed of light has decayed. During the question-and-answer session following the lecture, I questioned Brown about his sources on this and other subjects. He gave me a copy of his "The Scientific Case for Creation: 116 Categories of Evidence" (another precursor to his book) and two references in support of the speed-of-light decay. The citations Brown supplied for this claim, which he wisely avoided making in his book, were an article and a letter to the editor in *Nature* from a Mr. M. E. J. Gheury de Bray (Gheury de Bray, 1927b and 1931a).

While Gheury de Bray did, in fact, claim that the speed of light was decaying

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(though in Gheury de Bray, 1934b, he decided it was oscillating) and kept the debate going with frequent letters to *Nature* (1927a, 1931a, 1931b, 1931c, 1934a, 1934b), it turned out to be a tempest in a teapot. Ultimately, the criticisms of the discrepancies of the light-speed measurements as systematic and instrumentational errors (Birge, 1934; Kennedy, 1932; Kitchener, 1939; Vrkljan, 1931a and 1931b; Wilson, 1931) turned out to be correct, and advances in measurement technology resulted in an accurate and constant value of $c=2.997924580\times10^{8}$meters/second for the speed of light (Bergstrand, 1949 and 1950; Essen, 1950a and 1950b; Houston, 1949; Rossini, 1976).

Brown was not so careful, however, about the claims he made in the Australian creationist journal *Ex Nihilo* regarding Barry Setterfield's work. In that journal, he called Setterfield's work on speed-of-light decay "virtually unassailable" (*Ex Nihilo*, 1984)—after that work had already been the subject of heavy criticism in the "Letters" section of the same journal. Since then, Setterfield's data analysis has been recognized as being so contrived and selective that even the Institute for Creation Research has debunked it (Aardsma, 1988; Strahler, 1987, pp. 116–118).

Two- to Twenty-Celled Life Forms

Category seventeen of Brown's book states, "There are many single-cell forms of life, but there are no forms of animal life with 2, 3, 4, . . . or even 20 cells" (1987, p. 3). One of the sources he cites for this claim is *Five Kingdoms* by Lynn Margulis and Karlene V. Schwartz (1982). The pages he cites are a description of Mesozoa, described as having twenty to thirty jacket cells enclosing a long cylindrical axial cell. The description also notes that Mesozoa is possibly intermediate between protoctists and more complex metazoans.

But this does not support the claim that there are no forms of life with two to twenty cells. It appears that Brown has assumed that Mesosoa, being the simplest form in kingdom Animalia, is the simplest multicellular organism. But in Margulis and Schwartz's taxonomy, the kingdom listed before Animalia is Protoctista, rather than the usual Protista. The reason for this different term is because *protist* is usually taken to imply a unicellular organism, but Margulis and Schwartz's taxonomy recognizes multicellular forms in the kingdom (1982, p. 69). And, in fact, some multicellular forms may be found in earlier pages of the book. They state that Bacillariophyta (diatoms) "all are single cells or form simple filaments or colonies" (1982, p. 94) and that of class Desmidioideae (desmids) of phylum Gamophyta, "Most are single cells—more precisely, they are pairs of cells whose cytoplasms are joined at an isthmus" (1982, p. 100).

It is possible that Brown noted this and for that reason made use of the qualifier "animal life" in his claim (since protoctists are not animals). But if this is the case, his statement is quite misleading.

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Archaeopteryx

One of the criticisms I made in my original letter to Brown was regarding his footnote to category twenty (missing links), in which he states: "A strong case can be made that on the two Archaeopteryx specimens where feathers are clearly visible, it appears that the imprint of the feather was added after the fossils were discovered" (Brown, 1987), implying that both specimens are poorly disguised reptile fossils. Brown cites only articles supporting this view and none from peer-reviewed scientific journals. In my letter, I referred Brown to several anti-fraud articles, including a rather decisive rebuttal by Charig, Greenway, Milner, Walker, and Whybrow (1986). Yet, judging by his reply, Brown remained unconvinced. I am unaware whether or not the newly discovered *Archaeopteryx* specimen (Wellnhofer, 1988) has changed his mind.

It is worth mentioning that Brown's stance on this puts him in direct confrontation with many of his fellow creationists, including Duane Gish of the Institute for Creation Research, who insist that *Archaeopteryx* is "100 percent bird."

Human Evolution

Brown, like most creationists, claims that fossils of early humans are either apes or modern humans. In category twenty-three of his book, he states: "Stories claiming that fossils of primitive, ape-like men have been found are overstated" (Brown, 1987). In addition to the usual examples of Piltdown Man and Nebraska Man, Brown attacks *Ramapithecus*, Java Man, Peking Man, australopithecines, and Neandertal. Some of his attacks are warranted; for example, the primitive appearance of Neandertal was exaggerated due to reconstructions from skeletons of individuals with rickets, and it is indeed now doubtful that *Ramapithecus* was an ancestor to humans. Others, however, have a much less firm foundation.

Homo erectus. Brown states: "The discoverer of Java man later acknowledged that Java man was similar to a large gibbon and that he had withheld evidence to that effect" (1987). He cites an article by Eugene Dubois in which the claim is made that "Pithecanthropus [Java Man] was not a man but a gigantic genus allied to the Gibbons" (1973). The quote is genuine, but Brown fails to note that hardly anyone agreed with Dubois then and few but the creationists agree with him now. An article of response by W. E. Le Gros Clark (1937), which Brown does not cite, describes many of the problems with Dubois' view. The evidence today is that both *Pithecanthropus* and *Sinanthropus* (Peking Man) are properly classified as *Homo erectus*. Yet, Dubois maintained that, while Java Man was a giant gibbon, Peking Man was *Homo sapiens* (Le Gros Clark, 1937, p. 60).

It should be noted that Dubois was rather eccentric. When his discovery of Java Man near the village of Trinil in 1894 was greeted by a public uproar directed

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against him, he locked the bones up in strongboxes and refused to let anyone see them. At this time, he believed his discovery to be the "missing link," and anyone who disagreed with his interpretation was viewed as a personal enemy. In 1923, he finally consented to allow Dr. Ales Hrdlicka of the Smithsonian Institution to examine them, and Hrdlicka determined them to be an early human. By 1930, more discoveries made it clearer that Java Man was *Homo erectus*. But Dubois rejected any connection between Java Man and other finds, culminating in his opinion that it was simply a giant gibbon. Brown does not specify what evidence he thinks was withheld, but other creationists (for example, Eads, 1979, p. 147; Pitman, 1984, p. 90) claim that Dubois withheld evidence of two *Homo sapiens* skulls and human femura he found in Java before he discovered *Pithecanthropus*. Whatever the case may be, Dubois did mention one of the femura (which he claimed was part of Java Man, an identification which was questioned from the beginning since it was found fifteen meters away from the skull cap) and did publish articles about the skulls (1927, 1931). What the creationists fail to note is that the skulls were found in Wadjak, not Trinil, and that there are at least two stratigraphic levels at Trinil (Day, 1986, p. 338). Further finds in Java have confirmed the presence of *Homo erectus* (Day, 1986, pp. 341, 345–365. *See also* Jurmain, Nelson, and Turnbaugh, 1987, pp. 378–385; Strahler, 1987, pp. 489–490).

Brown also states that "Peking man is considered by many experts to be the remains of apes that were systematically decapitated and exploited for food by true man" (1987), but he cites only creationists in support of the claim. To Brown's credit, he does not make the more common claim that Peking Man is a fraud because the remains found between 1927 and 1937 were lost during World War II. This claim doesn't hold up since plaster casts of these finds still exist and additional pieces found in 1966 fit the casts (Scott, 1985, p. 2). Furthermore, fossil evidence for *Homo erectus* has been found in Europe, Asia, and Africa (Jurmain, Nelson, and Turnbaugh, 1987, p. 375).

Finally, Brown states: "Furthermore, Skull 1470, discovered by Richard Leakey, is more human-like and yet older than Homo erectus (Java man and Peking man) and the Australopithecines." Leakey's skull ER 1470 is generally classified as *Homo habilis*, which is less advanced than *Homo erectus*. While Leakey claimed a date for this skull as old as *Australopithecus*, there was controversy over the results of dating tests. Some found the beds where the skull was discovered to be as old as 2.41 million years, while others found the skull to be only 1.87 million years old. Further tests have recently resolved the controversy in favor of the younger date (Lewin, 1987, pp. 189–252).

Australopithecus. Brown makes a number of claims regarding australopithecines. For example, he states, "Detailed computer studies of the Australopithecines have conclusively shown that they are not intermediate between man and living apes" (1987). Brown is referring to Charles Oxnard's studies of *Australopithecus africanus*

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and *Australopithecus robustus* (1975). These studies are not conclusive and did not take into account Donald Johanson's "Lucy" (*Australopithecus afarensis*) skeleton. It should be noted that Johanson now believes, along with Oxnard, that *Australopithecus africanus* and *Australopithecus robustus* are not in the human lineage. Instead, he thinks *Australopithecus afarensis* is the common ancestor of both modern humans and the rest of the australopithecines.

Brown further states, "Lucy, a type of Australopithecine, was initially believed to have walked upright in a human manner. Studies of Lucy's entire anatomy, not just her knee joints, now show that this is highly improbable. She probably swung from the trees" (1987). In support of the first two sentences, Brown cites an article by William L. Jungers (1982). While it appears Brown is claiming that Lucy was not bipedal, he qualifies his claim with the phrase "in a human manner." This is because Jungers quite clearly states that "the bodily proportions of Lucy are not incompatible with some form of bipedal locomotion" (1982, p. 676). Jungers suggests, however, that Lucy's bipedal motion would be of short stride and slow pace compared to a human being.

In support of the third sentence, Brown cites articles by Jeremy Cherfas (1983) and Jack T. Stern and Randall L. Susman (1983). Brown's implication is that Lucy swung from the trees *instead* of walking upright on the ground, but these sources do not say that. Instead, both sources argue that, while Lucy was primarily arboreal (in itself a controversial claim), there is also very good evidence that she walked upright on the ground. The subtitle to the Cherfas article says, "Our ancestors undeniably walked upright before they became brainy. But how good was their posture?" (1983, p. 172) and Cherfas himself notes, "They did not walk upright exclusively" (p. 173). He also acknowledges the bipedal footprints attributed to *Australopithecus afarensis* (pp. 176–177) and states, "The evidence that Lucy was a proficient climber is very good, that she was an inefficient biped less so, but still persuasive" (p. 178). Stern and Susman conclude, "The bipedality practiced by the Afar hominid was not entirely modern-like" (1983, p. 280. *See also* Jurmain, Nelson, and Turnbaugh, 1987, pp. 339–344; Strahler, 1987, pp. 482–485).

Out-of-Order Human Fossils

In category twenty-four, Brown says:

> Bones of many modern-looking humans have been found deep in rock formations that were formed long before man supposedly began to evolve. Examples include: the Calaveras Skull, the Castenedola Skull, Reck's Skeleton, and many others. Other remains present similar problems, such as: the Swanscombe Skull, the Steinheim fossil, and the Vertesszollos fossil. These remains are almost always ignored by evolutionists.

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Contrary to Brown's claim, the Swanscombe, Steinheim, and Vertesszollos fossils can typically be found in introductory physical anthropology textbooks (for example, all three are discussed in Jurmain, Nelson, and Turnbaugh, 1987: Swanscombe on pp. 416–417, Steinheim on pp. 414–415, and Vertesszollos on p. 395). It is not clear what problems Brown thinks these fossils present. The Vertesszollos skull fragment is classified as *Homo erectus* and may have some archaic *Homo sapiens* traits, while the Swanscombe and Steinheim fossils are both classified as early *Homo sapiens*. All three are considered to be transitional forms. While the Vertesszollos fragment was thought to be rather advanced for its age, new studies have come up with a more recent date for it (Day, 1986, p. 100). The problems these fossils create are for the creationists who claim there are no transitional forms in the fossil record.

Among the "many other" examples of "modern-looking humans" cited by Brown is *Oreopithecus bambolii*. Brown cites two articles by William L. Straus, Jr. (1957 and 1958). These articles describe findings of skeletal fragments in Italy of a "possibly hominid" creature. The fragments are estimated to be from the upper Miocene (perhaps ten million years old). Brown fails, however, to cite a later article by Straus and Schon (1960) in which the brain capacity of *Oreopithecus* is estimated to be in the 276- to 529-cubic-centimeters range, about the range of chimpanzees and orangutans. In this later article, Straus and Schon state that *Oreopithecus* is "probably hominoid" but that it is unclear if it is a pongid, hominid, or in a family by itself. Jurmain, Nelson, and Turnbaugh simply identify it as an Old World anthropoid possibly related to *Apidium*, an Oligocene anthropoid (1987, p. 242). It should be noted that none of these classifications presents any particular problem for evolution. The article Brown does not cite makes it quite clear that this organism was not a "modern-looking human."

"Reck's skeleton," better known as Oldoway Man, was a skeleton of what was apparently a mid-Pleistocene hominid discovered in Olduvai Gorge in East Africa in 1914 by Hans Reck (Reck, 1931. *See also* "Notes," 1914). Its most unusual feature is the number of teeth it possesses—thirty-six instead of the usual thirty-two. While Reck and Louis Leakey thought that it was a very early instance of *Homo sapiens*, it was later found to have been intrusively buried in older ground (Boswell, 1932; Leakey et al., 1933; Lewin, 1987, p. 131). Another intrusive burial case cited by Brown is a skeleton found in 1971 in Moab, Utah. This skeleton has been recently dated at two hundred to three hundred years. Details may be found in Strahler (1987, pp. 470–471).

The Calaveras Skull. The Calaveras skull was taken from a California mine shaft on February 25, 1866. It was identified by California state geologist James D. Whitney as a modernlike human skull. Whitney dated the auriferous gravel from which it was excavated as from the Pliocene epoch (Whitney, 1867, 1880). This find, if genuine, would certainly present problems for evolution, since *Homo sapiens*

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is not only post-Pliocene but is not believed to have entered the New World until thirty thousand years ago at the earliest and probably not until about twelve thousand years ago.

In support of Brown's claim for the Calaveras skull as a problem for evolution, he cites articles by W. H. Brewer (1866), Whitney (1880), and William H. Holmes (1899). Brewer's article (as well as another by Whitney, 1867) is simply an announcement of the find. Whitney's 1880 article, along with articles by George F. Becker (1891) and Sydney B. J. Skertchly (1888), argues for the authenticity of the skull and other artifacts found in the mines. However, the article by Holmes and another uncited article by William P. Blake (1899) provide convincing arguments that the Calaveras skull is that of a modern Indian and had recently been placed in the mine. In brief, the evidence against the skull and other artifacts is as follows:

1. The skull is no different from that of a modern human and the other implements are identical to those used by contemporary Indians of the region (Holmes, 1899, pp. 423–424);
2. The skull and other objects, including fragile obsidian blades, do not exhibit the wear or damage that would occur in the gravel bed of an ancient river (Blake, 1899, p. 631);
3. A modern snail shell was found attached to the skull (Blake, 1899, p. 632; Holmes, 1899, p. 468);
4. The miners and shopkeeper John Scribner were known for playing practical jokes, particularly on Dr. William Jones, who was the person who turned the skull over to J. D. Whitney (Holmes 1899, p. 459);
5. The locals believed the skull discovery to be a hoax perpetrated by Scribner (Holmes, 1899, p. 460);
6. George Stickle, a friend of Scribner's and the postmaster of Angel's Camp where the skull was allegedly discovered, told Holmes that he had the skull before Scribner and that it had been obtained from an Indian burial place in Salt Spring Valley by a man named J. I. Boone (Holmes, 1899, p. 463);
7. Indians of the high sierra buried their dead by casting them into pits, caverns, and gorges (Holmes, 1899, pp. 463–464).

MacDougall further claims that Scribner confessed the hoax to his sister and pastor before his death (MacDougall, 1958, p. 206; *see also* Weber, 1981, p. 21), but I have not been able to substantiate it and I am generally skeptical of deathbed confession stories. In any case, the evidence does point toward a hoax by Scribner and his associates.

What is remarkable is that Brown cites the Calaveras skull while at the same time citing a convincing debunking of it (Holmes, 1899). It makes one wonder if Brown even reads the articles he cites.

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Out-of-Order Human Artifacts

Brown's category sixty-three contains reports of artifacts found buried in rocks that formed before the origin of humans. Of the dozen or so examples cited, I found primary sources for two. The first of these Brown simply mentions in his list as "a doll." This refers to a clay figurine found while drilling for water in Nampa, Idaho, allegedly at a depth of three hundred feet (Wright, 1889). A year later, the *American Antiquarian and Oriental Journal*, which first reported the find, stated, "There are no evidences against its genuineness" ("The Nampa Image," 1890, p. 366). However, by 1892 it was generally regarded as a hoax (Brinton, 1892; McGee, 1892). D. G. Brinton, in a review of a book by G. Frederick Wright that promoted the "Nampa image," stated:

> It is sad to destroy illusions; but when this same image with its story was laid before a well-known government geologist, and he at once recognized it as a clay toy manufactured by the neighboring Pocatello Indians, the person displaying it replied with engaging frankness, "Well, now, don't give me away!" [Brinton, 1892]

W. J. McGee (1892) felt that Brinton was too generous to Wright's book and called the Nampa image a transparent fraud—a charge to which Wright did not bother to respond. On the other hand, Wright asked Brinton to provide details in support of his clay toy claim (Wright, 1893a), but I was unable to find a response.

Another object Brown lists is "a strange hammer"—the "Ordovician Hammer" of creationist Carl Baugh, found near London, Texas. This hammer is apparently a nineteenth-century miner's hammer that was dropped into a crack in the rock (Cole, 1985), but nothing conclusive can be said about it: Baugh has consistently refused to allow the hammer to be radiocarbon dated, a process that would settle the matter once and for all.

Noah's Ark

As noted previously, eleven of Brown's 120 "categories" of evidence are alleged sightings of Noah's ark on Mount Ararat (Agri Dagi). These items consist of evidence presented by Brown to the effect that, among other things, Marco Polo "stated that the ark was reported to be on a mountain," that it was discovered by a British team "but the British scientists threatened to kill the guides if they reported it," that Russian soldiers found the ark "but before they could report back to the Czar, the Russian Revolution of 1917 had begun," and that aerial photographs have been taken of the ark "although the pictures have not been located" (Brown, 1987). Brown concludes this section of evidence with unintentional humor by stating,

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"There are many other stories. . . . *Only the most credible are summarized above*" (emphasis added).

Most, if not all, of Brown's ark sightings are of questionable value. For example, category ninety-four describes a case:

> A Russian pilot, flying over Ararat in World War I (1915), thought he saw the Ark. The news of his discovery reached the Czar, who dispatched a large expedition to the site. The soldiers located and explored the boat, but before they could report back to the Czar, the Russian Revolution of 1917 had begun. Their report disappeared, and the soldiers were scattered. Some of them eventually reached the United States. Various relatives and friends have confirmed this report. [1987]

This story apparently originated as an April Fool's Day joke in the April 1, 1933, edition of the German newspaper *Kolnische Illustrierte Zeitung* (Parrot, 1955, p. 64). The story was then printed by several magazines, including the November 1941 issue of *The King's Herald*, the March 1942 issue of *Prophecy*, the October 1942 issue of *Defender of the Faith*, and in an article by Floyd M. Gurley in a 1940 issue of the Los Angeles–based magazine *New Eden*. By 1945, *New Eden* and two of the other magazines had retracted the story, but it continues to be repeated. Howard M. Teeple notes that varying versions of the story existed (1978). In some versions, such as the one Brown reports, the soldiers explored and took measurements of the ark. In other versions, they were unable to get to the ark because of water, poisonous snakes, and insects. The ark is also reported as being either in a swamp or on the shore of a lake. Either way, the story contradicts several others also mentioned by Brown (*see also* Bailey, 1978, p. 55; Moore, 1981, p. 8; Temple, 1978, pp. 103–106).

Conclusion

I have addressed here only a few of Walter Brown's 120 "categories" of evidence challenging evolution, but the results do not inspire confidence in the reliability of the rest. I suspect that the results obtained from investigating the rest would be similar to those obtained from examining these few. Indeed, books such as A. N. Strahler's monumental *Science and Earth History* (1987) have already demonstrated this. Under close scrutiny, it is doubtful that more than a dozen of Brown's claims would remain, and these would simply constitute a catalogue of some current controversies in science.

There appears to be a more serious problem, however, with Brown's research and possibly with his entire attitude toward science. In my initial five-page criticism of Brown's work, I referred to Brown's list of sixteen allegedly "unexplainable

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features" of Earth and stated that, according to a graduate student of Arizona State University's geology department, all sixteen of these features are not only explainable but have well-known and commonly accepted explanations. Yet, as one can clearly see from Brown's response, he has rejected the possibility of explanations *sight unseen*. Given such lack of interest on Brown's part, there seems to be little hope that the quality of his research will improve significantly in the near future.

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Brown Responds to Lippard

Walter T. Brown, Jr.

First of all, I would like to express my appreciation to *Creation/Evolution* for allowing me to respond to Jim Lippard's article. For many years, I have been convinced that the best way to bring more light and less heat to the creation-evolution debate is for the protagonists to jointly publish their scientific views—point by point and side by side. This would overcome the tendency of many in both camps to speak primarily to their constituencies and to misrepresent their opponents. Aggravating this tense situation even further are the obvious religious and philosophic aspects which have deep roots in almost everyone involved on both sides of this debate. Therefore, sticking to just the scientific matters and debating them jointly in print will certainly add clarity to this overly polarized and heated issue.

One general shortcoming of Lippard's critique is that he used an outdated edi-

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tion (1986) of *The Scientific Case for Creation*. The current edition is considerably expanded. Two of Lippard's relatively minor but valid criticisms were corrected in it, independently of Lippard. I will point these out shortly. This latest edition was sent to the editor of *Creation/Evolution* when I was notified that he was considering publishing Lippard's article. A new edition will be published in September 1989.

Let's now look at some of Lippard's specific statements.

Lippard: "He [Brown] is perhaps best known for his frequent debate challenges—challenges, it should be noted, that are proffered under such strict conditions as to preclude almost all potential opponents. These restrictions include the requirement that the opponent must have a doctorate and must sign a contract agreeing to limit the subject to scientific content only; no religion is to be discussed (see, *Parrish ['I Was Suckered into a Debate—and Survived,'* Creation/Evolution *XXIII].)"*

What's wrong with that? Actually, my simple conditions have always been less restrictive than Lippard implies. For example, even Mr. Lippard, who is a graduate student not in science but in philosophy, could participate. All he has to do is team up with a scientist, a science professor, or a person with a Ph.D. in a technical field. I recognize that many who do not have such credentials may be very knowledgeable—more so than I. However, if I debated those without the more formal qualifications, any weakness in their presentation would be blamed on their apparent lack of qualifications and not on the weakness of their position. Despite my precautions, I have been criticized by many evolutionists after debates for supposedly "setting up" evolutionists who were perceived as unqualified or incompetent even though they held scientific doctorates. Dr. Fred Parrish, to whom Lippard referred, was one such case.

What Lippard calls a "contract" is simply a one-page "Statement of Agreement" on the time, place, topic, and format of the debate. Having all of this clearly spelled out and agreed upon ahead of time prevents any honest person from claiming that he or she was "suckered into a debate." The sentence in the contract to which evolutionists have most objected is the specification that only science and not religion be discussed. The scientific community would be appalled to know how frequently evolutionists have objected to discussing just science.

Lippard: "Several of Brown's [120] categories also do not meet his description of them as 'categories of scientific evidence that support a sudden creation and oppose gradual evolution.' Some neither support creation nor oppose evolution; for example, category three argues against the Lamarckian view that acquired characteristics are inherited . . ." (no omission; sentence continues).

Lamarckism is not just of historical interest. Some evolutionists advocate or entertain Lamarckian explanations. Darwin did. Even modern evolutionists, frustrated

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at not being able to find some mechanism for macroevolution, are considering Lamarckian concepts (*see*, for example, *Nature*, January 12, 1989, 337:101–102).

Lippard: ". . . some [of Brown's 120 categories] are philosophical rather than scientific; for example, category thirty-six is an argument from design to the existence of a designer . . ." (no omission; sentence continues)

I doubt that most readers would consider category thirty-six to be philosophical. It reads:

> *Almost every complex effect that modern science has "discovered"—whether it involves electrical, acoustical, mechanical, or optical phenomena—is found in living systems.* Detailed studies of various animals have also revealed certain physical equipment and capabilities that cannot *even be copied* by the world's best designers using the most sophisticated technologies. For example: the miniature and reliable sonar systems of dolphins, porpoises, and whales; the frequency-modulated radar and discrimination system of the bat; the aerodynamic capabilities and efficiency of the hummingbird; the control systems, internal ballistics, and combustion chamber of the bombardier beetle; the precise and redundant navigational systems of many birds and fish; and especially the self-repair capabilities of practically all forms of life. The many components of each complex system could not have evolved in stages without placing a selective disadvantage on the animal. All evidence points to a Designer.

(The references and expanding comments in this excerpt and others following are omitted due to space constraints. The references already given in Lippard's article are also omitted. I have placed in italics the statements in the 1989 edition of *The Scientific Case for Creationism* which differ slightly from the edition Lippard used. If the difference is significant to his conclusion, I will use the 1986 edition which Lippard used.)

I find only one philosophical category in the entire book:

> If life is ultimately the result of random chance, then so is thought. Your thoughts—including what you are thinking right now—would, in the final analysis, be a consequence of a long series of accidents. Therefore, your thoughts would have no validity, including your thought that life is a result of chance or natural processes. *By destroying the validity of ideas, evolution undercuts even the idea of evolution.*

Lippard: ". . . and some [of Brown's categories] simply argue for the possibility of special creation; for example, category fifteen argues that similarities between

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different forms of life may imply a common designer rather than a common ancestor.''

Lippard's statement is out of context and inaccurate. My exact statement was:

> It is illogical to maintain that similarities between different forms of life always imply a common ancestor; they may imply a common designer. In fact, in cases where experiments have demonstrated that similar structures are controlled by different genes *or developed from different parts of embryos*, a common designer is the more likely explanation.

In other words, I did not simply argue for the possibility of creation; I said that *some similarities favor creation.*

The Speed of Light

Lippard next challenged the possibility that the velocity of light has decreased. Let me first explain why this is relevant to the creation-evolution debate.

If you asked me what were the most serious difficulties that I as a creationist have, my answer would be that I have only two. First, most scientific dating techniques indicate that the earth, the solar system, and the universe are young—possibly less than ten thousand years old. (I have described twenty-four categories in *The Scientific Case for Creation.*) However, if the velocity of light has been constant, if most stars and galaxies are billions of light-years away (as I believe), and if we can tell in some instances that starlight reaching the earth originated at the distant stars, then that would imply the universe is billions of years old.

The second problem concerns radiometric dating. Have decay rates, which are essentially constant today, always been constant? What are the root causes of radiometric decay? I am not interested in the simplistic answers but, rather, in answers that explain the nuclear forces and what affects them. I do not believe anyone can honestly answer these questions today.

If it could be shown that the vibrational frequencies of atoms decreased enormously in the past, then both the velocity of light and the rate of radiometric decay should have decreased proportionally. We would then understand why two age-estimating techniques (starlight and radiometric decay) are inconsistent with many others. The two problems mentioned above would disappear. If the earth is younger than even several hundred million years, then most knowledgeable evolutionists would probably admit that evolution could not have occurred. For all but a few diehards, the current creation-evolution debate would end.

Lippard: ''The citations Brown supplied for this claim [that the speed of light had

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decreased], which he wisely avoided making in his book, were an article and a letter to the editor. . . .''

Wrong. I devoted over two pages in the book to this subject (pp. 46–48) and included many references. Since Lippard also gives the wrong publishing date for *In the Beginning* (1987 instead of 1986), I wonder if he has actually read the book.

Lippard: ''Brown was not so careful, however, about the claims he made in the Australian creationist journal Ex Nihilo *regarding Barry Setterfield's work. In that journal, he called Setterfield's work on speed-of-light decay 'virtually unassailable'* (Ex Nihilo, *1984).''*

I have never said that Setterfield's research—or anyone else's research—was "virtually unassailable." Everyone's research is assailable, mine included. That is one reason why science is so successful and dynamic. To my knowledge, I have never been quoted in *Ex Nihilo*. Who is the source of Lippard's "*Ex Nihilo*, 1984" reference? In discussing Setterfield's work, I have always tried to carefully point out that it may turn out to be wrong. Scientific conclusions are always tentative. To claim otherwise—as Carl Sagan and many other evolutionists do when they say that evolution is a "fact"—is dogma, not science.

Lippard: ''Setterfield's data analysis has been recognized as being so contrived and selective that even the Institute for Creation Research has debunked it (Aardsma, 1988). . . .''

ICR's Aardsma correctly recognized that the past measurements of the velocity of light (c) should be weighted according to their accuracy. Setterfield had not done so. I pointed this out in a letter to Setterfield in 1981 and again in detailed, face-to-face discussions in 1984. Unfortunately, Aardsma used a statistical weighting procedure that is valid only for linear phenomena. The decay of c (abbreviated: *cDK*) appears to be highly nonlinear. After Aardsma published his results and at Setterfield's request, I did the weighting analysis I had advocated. It involved a very time-consuming computer simulation technique that assumes no particular decay pattern. Included were all 164 of the known measurements of the velocity of light and their published or estimated experimental errors. In all, sixteen different measurement techniques for the velocity of light were used, such as the toothed wheel and rotating mirrors. The results of my study supported Setterfield's hypothesis. I am aware of only one other statistical study that took all of Setterfield's historical data and still claimed that c has been constant (R. Brown, 1988). That study, however, contained a mathematical error. When corrected, those calculations also supported *cDK*. Statisticians in various countries have reached conclusions similar to mine.

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Many other surprising developments have occurred since 1986 when I last wrote about the possibility of *cDK*:

1. A Soviet cosmologist has concluded, independently of Setterfield, that the velocity of light was ten billions time faster at time zero. He attributes the cosmic background radiation and most red shifts to *cDK* (Troitskii, 1987). If his analysis is correct, the standard Big Bang theory will fall (with a big bang!).
2. Atomic clocks do not seem to keep the same time as dynamic clocks. For example, the angular velocities of Mercury, Venus, and Mars are increasing when measured by atomic clocks (Van Flandern, 1981, 1984). There are two obvious possibilities: either the gravitational constant is changing or atomic frequencies are decreasing. Take your pick. Van Flandern favors the former but acknowledges that the latter is possible. If atomic frequencies are decreasing, then: (1) atomic clocks would slow down relative to dynamic clocks (as is observed); (2) there would be *cDK* (as I believe the historical measurements of *c* show); (3) radioactive decay rates would decrease proportionally; and (4) the light from distant stars would arrive on planet Earth much faster—perhaps ten billion times faster in the ancient past, as Troitskii claims.
3. Quasars are observed ejecting jets of matter at many times the current speed of light. Several years ago, this was thought to be simply a relativistic effect that occurs when the jets are aimed at the earth. So many quasars which have superluminal jets have now been discovered that the relativistic explanation is generally rejected. It is simply too improbable that so many random jets would be moving toward the earth. None of this contradicts Einstein's second postulate that the velocity of light *is independent of the velocity of its source.* The *cDK* hypothesis is that the velocity of light *is dependent upon time.*
4. Experiments have been conducted in which it is claimed that radio signals were made to exceed the official velocity of light (c=299,792.458 km/sec) by factors of two and one hundred (Pappas and Obolensky, 1988). Counterexplanations are being proposed to explain these surprising results. As of now, no one has repeated Obolensky's experiments, perhaps because of the expense of certain very precise equipment (Obolensky, 1989). Only time and further experiments will sort out the truth. Similar results have been experimentally and theoretically demonstrated with electrical signals (Milnes, 1983).

As mentioned earlier, if atomic vibrations are decreasing, c should decrease proportionally. The velocity of light would be constant *in atomic time* but not in dynamic time. Since about 1960, atomic clocks began being used to measure c, and only since then have these very precise results shown a constant c. Obviously, precise results are not necessarily accurate results.

All physical laws are preserved if there is *cDK*. However, atomic properties, such as Planck's constant, would change. Such changes seem to be observed based

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upon historical measurements, although I am not convinced that the statistical case for this is persuasive for certain "constants." Much more could be written on the possibility of *cDK*. Some of it has revolutionary implications. All one can say at this time is that a case can be made for *cDK*. In my opinion, it is a good case. Reasonable people may disagree. I hope competent researchers will try to falsify the *cDK* hypothesis. However, people who close their minds to the possibility of *cDK*, or to any other surprising phenomena for which there is sound experimental data, fail to understand what scientific inquiry is all about.

Two- to Twenty-Celled Life Forms

Lippard: "Category seventeen of Brown's book states, 'There are many single-cell forms of life, but there are no forms of animal life with 2, 3, 4, . . . or even 20 cells.' . . . One of the sources he cites for this claim is Five Kingdoms *by Lynn Margulis and Karlene V. Schwartz. . . . The pages he cites are a description of Mesozoa, described as having twenty to thirty jacket cells enclosing a long cylindrical axial cell. The description also notes that Mesozoa is possibly intermediate between protoctists and more complex metazoans.*

"But this does not support the claim that there are no forms of life with two to twenty cells" (only references omitted).

In my footnote 17c, I explained why Mesozoa *are not* intermediate between protoctists and more complex multicellular organisms:

> The form of life that has just over 20 cells is a very simple *parasite* called the mesozoa. It must have a complex animal as a host in order to provide it with such functions as digestion and respiration. The mesozoa could not be the evolutionary predecessors of any so-called higher animals since it requires a higher animal as its host.

The remainder of Lippard's comment alludes to colonial forms of life being an evolutionary bridge between single-celled life and life with thousands of cells. Libbie Henrietta Hyman has pointed out the many differences between colonial forms (Hyman, 1940, pp. 248–255). Consider, for example, nerve cells and the genetic machinery required for embryonic development.

Archaeopteryx

Most scientists know that the scarcity, or perhaps complete absence, of transitional

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forms in the fossil record is a very serious problem for evolutionism. The most frequently cited example of a possible but disputable transition is *Archaeopteryx*. Lippard implies that my only reaction to *Archaeopteryx* is to say that it is a hoax. I have never said that *Archaeopteryx* is a hoax. I frankly don't know. I did say that Sir Fred Hoyle and others are claiming that it is a hoax. As of 1986, at least, they were making a good case. I then concluded by saying:

> Even if Archaeopteryx is not a forgery, it could not be ancestral to modern birds since the fossils of two modern birds have been found that are supposedly much older. For details see: Tim Beardsley, "Fossil Bird Shakes Evolutionary Hypotheses," *Nature* 21 August 1986, 322:677.

Lippard missed the point.

Human Evolution

I would like to compliment Lippard and his helpers, Robert P. J. Day and Stephen L. Zegura, on their study of alleged human evolution. I would consider it progress if all evolutionists admitted or knew as much as they. Our positions, at least, on what the evidence is are not too far apart. The extreme scarcity of data—that is, bones—probably accounts for most of our differences. However, since so many of Lippard's comments are irrelevant to our few differences, I must summarize my position (category twenty-four). Again, over twenty-seven references are omitted from the following passage due to space constraints:

> Stories claiming that fossils of primitive, apelike men have been found are overstated.
>
> It is now universally acknowledged that Piltdown Man was a hoax, and yet it was in textbooks for over forty years.
>
> The only evidence for Nebraska Man turned out to be a pig's tooth.
>
> Prior to 1978, the evidence for Ramapithecus consisted of a mere handful of teeth and jaw fragments. It is now known that these fragments were pieced together incorrectly by Louis Leakey in a form resembling part of the human jaw. Ramapithecus was just an ape.
>
> The discoverer of Java Man later acknowledged that Java Man was similar to a large gibbon and that he had withheld critical evidence.
>
> The fossils of Peking Man are considered by many experts to be the remains of apes that were systematically decapitated and exploited for food by true man. Furthermore, Skull 1470, discovered by Richard Leakey, is more humanlike and yet older than Homo erectus (Java Man

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and Peking Man) and the Australopithecines. Since man cannot be older than his ancestors, something is wrong.

The first confirmed limb bones of Homo habilis have recently been discovered. They show that this animal clearly had apelike proportions and should never have been classified as manlike (Homo).

Detailed computer studies of the Australopithecines have shown conclusively that they are not intermediate between man and living apes. The Australopithecines, which were made famous by Louis and Mary Leakey, are actually quite distinct from both man and living apes. One Australopithecine fossil, referred to as Lucy, was initially presented as evidence that the Australopithecines walked upright in a human manner. However, studies of Lucy's entire anatomy, not just her knee joints, now show that this is highly improbable. She probably swung from the trees. The Australopithecines are a type of extinct ape.

For about 100 years the world was led to believe that Neanderthal Man was stooped and apelike. Recent studies show that this erroneous belief was based upon some Neanderthal men who were crippled with arthritis and rickets. Neanderthal Man, Heidelberg Man, and Cro-Magnon Man were completely human. Artists' depictions, especially of their fleshy portions, are often quite imaginative and are not supported by the evidence. Furthermore, the techniques used to date these fossils are highly questionable.

The above is what I have published. Now let's look at Lippard's critique. Several of Lippard's statements concerning human evolution are inaccurate.

Lippard: "Brown, like most creationists, claims that fossils of early humans are either apes or modern humans."

No. My position is that fossils of *alleged* human ancestors are either apes, humans, *or hoaxes.*

Lippard: "These studies [of Charles Oxnard] are not conclusive and did not take into account Donald Johanson's 'Lucy' (Australopithecus afarensis) *skeleton."*

No scientific studies are conclusive, and I should not have used that term. Nevertheless, to the best of my knowledge, Oxnard's multivariate analysis has never been equalled in the insights, the details, and the cross-comparisons it provides. Nor do I know of any challenges to his work.

Lippard referred to an important paper by William Jungers. I had the opportunity to discuss this matter with Jungers in 1982. He told me that Lucy was so top-heavy that her most efficient gait would be on all fours. Lucy's curved fingers

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indicate that she swung from the trees. It is true that the shape of Lucy's alleged knee joint implies that she *could* walk upright. That does not mean she did. However, Donald Johanson, Lucy's discoverer, apparently made quite an admission at the University of Missouri in Kansas City on November 20, 1986. When asked during the question-and-answer session, "How far away from Lucy did you find the knee?" Johanson's reported answer was, "Sixty to seventy meters lower in the strata and two to three kilometers away" (Willis, 1987)! Johanson needs to clarify or deny this in writing. None of his published writings do.

Lippard tries to dismiss Skull 1470 by saying that its age has been changed to 1.87 million years. Many authorities disagree with that date. But let's assume that the age is correct. William Fix devoted a chapter to this (1984, pp. 50–61). Here are some excerpts:

> Even at 1.8 million years, 1470 still destroys the ancestral status of [*Australopithecus*] africanus. . . . the case for africanus as a missing link is revealed as the piece of imaginative speculation it always was. Again, we are reminded of Piltdown. The greatest difference between Piltdown and the africanus affair is that the africanus fossils are genuine. As in other cases, the deception the profession suffered with africanus was again self-inflicted through its overeagerness to read into the fossils "some special place or significance in the line of direct human descent, as opposed to that of the family of apes." In fact, africanus was more likely ancestral to the chimpanzee than to man. But the American end of the profession in particular seems to be laboring under the assumptions that an animal ancestor is good for us and that the truth about this ancestor may be arrived at by majority vote within the profession. [p. 53]

> The truth—and this will become even more evident as we examine the remaining ancestral candidates—is that Piltdown was not an unfortunate lapse of scientific poise in the infancy of this discipline, but was symptomatic of its standard operating procedure. Much anthropological literature written before 1973 is now as obsolete as that endorsing Piltdown man as an ancestral form. But there has been little righteous thunder over the africanus affair by those concerned with the integrity and credibility of science. The generation of Eiseley, Zuckerman, Boule, and Louis Leakey has passed, and most of those who have replaced them are not inclined to rock the boat, especially since the external threat from the fundamentalists [scientific creationists] has become more acute. Consequently, there is very little public awareness that paleoanthropology has replayed Piltdown with a vengeance. [p. 55]

Birdsell addressed the situation in the belief that 1470 was 2.8 million years old, but as indicated, even if it is only 1.8 million years old, its revolutionary

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> impact is little diminished. Birdsell refers to "the problem of ER 1470"—a major problem at the very heart of evolutionary theory. [p. 59]
>
> As far as he [Birdsell] is concerned, the story of human evolution has been revolutionized by 1470, and no satisfactory synthesis replacing the old scheme has yet been achieved. [p. 60]

Lippard objects several times to my referencing studies done by creationists. It would be more enlightening and show less bias if he critiqued the studies instead of attacking the people who did them. Actually, I usually reference evolutionists. But as most readers know, if a creationist references an evolutionist, he or she is frequently charged with taking the author's conclusions out of context—"because the author is, after all, an evolutionist." Catch-22.

If Lippard does not believe my statements about Peking Man because I cited works—very extensive works—by creationists, then he should study *Fossil Men* by Marcellin Boule and Henri Vallois (1957, pp. 110–146). These evolutionists at least acknowledge the possibility that Peking "men" were just apes that were hunted by true humans. Again, the evidence on Peking Man is thin, although I believe it favors the creationist view. But isn't that a good reason for presenting both sides?

Out-of-Order Human Fossils

Lippard: "Contrary to Brown's claim, the Swanscombe, Steinheim, and Vertesszollos fossils can typically be found in introductory physical anthropology textbooks. . . ."

Once again, Lippard misrepresents my position. I said that the remains of these and other documented human fossils, when found in rocks that are too old by evolutionist standards, are almost always ignored by evolutionists. Yes, a few textbooks do mention them. But seldom do they explain the contradictions these fossils pose. Fix sums it up well: "In conjunction with Swanscombe, Steinheim, and Fontechevade, it certainly shows that there is significant evidence that modern-type humans were in existence long before Neanderthal. Accordingly, it is difficult to see how Neanderthal could have been our ancestor" (p. 105). Contrary to what Lippard says, most textbooks that deal with our supposedly apelike ancestors ignore all this data. Shouldn't we teach all the evidence? Let's teach students how to think, not what to think.

I must apologize for one error that Lippard caught. Actually, Ron Calais brought it to my attention first. In a footnote, I mentioned that *Oreopithecus bambolii* was human. That view is no longer held. William L. Straus, who pointed out its human aspects for many years, withdrew that claim when a complete skeleton of this ape

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was found. The error has been corrected in the current edition of *The Scientific Case for Creation.* In publishing the latest edition, I also withdrew the Moab skeleton from that same footnote. Over the past several years, my doubts concerning its human status have increased.

Lippard and others claim that several of the other human skeletons I mentioned were buried intrusively. Perhaps. I have been aware of these claims and counter-claims. However, in each instance I cited, I believe that the evidence tips in favor of no intrusive burial. For example, in the case of the Castenedolo skeletons, Sir Arthur Keith correctly stated the enigma that evolutionists face: "As the student of prehistoric man reads and studies the records of the 'Castenedolo' find, a feeling of incredulity rises within him. He cannot reject the discovery as false without doing injury to his sense of truth, and he cannot accept it as a fact without shattering his accepted beliefs" (1925, p. 334).

However, after examining the strata above and below the Castenedolo skeletons, and after finding no indication that they were intrusively buried, Keith surprisingly concluded that the enigma must be resolved by an intrusive burial. He justified this by citing the unfossilized condition of the bones. However, these bones were encased in a clay layer. This would prevent water from transporting large amounts of dissolved minerals into the bone cells and explain the lack of fossilization. The degree of fossilization relates to chemistry, not age.

Lippard, regarding the Calaveras skull: "It makes one wonder if Brown even reads the articles he cites."

I have read and pondered those articles several times over the past eight years. I should have explained that I was including them in the interest of completeness. For many years, stories have circulated that the Calaveras skull, buried 130 feet below ground, was a practical joke. However, that tidy explanation conveniently overlooks the many other bones and human artifacts, such as dozens of bowls made of stone, found throughout that part of California. These artifacts have been found over the years under apparently undisturbed strata and a layer of basaltic lava (Whitney, 1880, pp. 262–264, 266, 274–276).

Again, in my opinion, the evidence tips in favor of the view I presented. This issue may never be resolved scientifically. Why, then, should one side of this question be suppressed?

Out-of-Order Human Artifacts

Lippard: "On the other hand, Wright asked Brinton to provide details in support of his clay toy claim, but I was unable to find a response."

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There was no response by Brinton, much to Wright's disgust. Why do you suppose that Brinton, who made the charge that the Nampa figurine was a hoax, failed to produce his evidence?

Lippard: ". . . Baugh has consistently refused to allow the hammer to be radiocarbon dated. . . ."

No, he has not. Dr. Carl Baugh assured me four years ago and again on June 2, 1989, that he would like to have the wooden handle of his hammer radiocarbon dated. He has three understandable stipulations: (1) that he accompany the hammer at every stage of the testing; (2) that some outsider pay for all aspects of the test; and (3) that the hammer be dated by the accelerator mass spectrometer technique. The reason for the last stipulation is that the standard radiocarbon dating technique would destroy most, if not all, of the wood in the hammer.

Noah's Ark

I believe there is archaeological evidence that Noah's ark exists. Of course, we can only be sure once it is found. If a person's mind is open to the possible existence of the ark, much can be said. However, giving such information to a skeptic accomplishes nothing. I believe that some claims of the ark's existence are false. I have helped identify such fabrications and honest errors. On the other hand, the deeper we dig into other accounts, the more credible they seem.

Some writers referenced by Lippard have learned from ark-hunters which stories are probably false. These are the accounts the critics enjoy attacking. Another tactic of theirs is to show contradictions between the "false" reports and those that appear very credible. Again, to a skeptic, all I can say is wait.

Conclusion

Lippard has taken almost three years to search out what he feels are the weakest of the 120 categories of evidence that support creation and oppose evolution. He has addressed only parts of a very small percentage of them. Each reader can judge Lippard's accuracy, competency, and thoroughness. Readers can also see who has made the misleading statements.

Recently, a columnist for a large state university newspaper wrote an editorial after reading the same case that Lippard examined. He had a different view:

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> Well, I've read [the] arguments as I'm sure many of you have—and they aren't simplistic, they aren't mystical, and they don't even require the reader to believe in the Bible. What they do require is that students of mankind's history challenge their evolutionary beliefs. And that they engage in debate, discussion and research into the big question—"Where did we come from." Where is the indoctrination if all sides are presented openly? If scientific creationism is such a paper-thin theory, professors should spend some time matching it up to evolution in class—let the best theory win. That's what the academic community is all about. [Hostetler, 1988, p. 4]

I hope Lippard and I can agree on that.

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Editor's Note

And so we begin another debate in the pages of *Creation/Evolution!* In the past, creationists R. G. Elmendorf, Robert E. Kofahl, Norman L. Geisler, and E. W. Faulstich have participated here in such printed exchanges. Creationist authors Duane Gish, Carl Baugh, John Morris, Robert V. Gentry, and perhaps others have used different forums to respond to *Creation/Evolution* articles. Meanwhile, most *Creation/Evolution* articles are written in response to things published by leading creationist authors. So, in a sense, debate is what this journal is about.

However, the editors wish to avoid duplication of arguments already made. Because some of the arguments in the current exchange have been adequately addressed previously, those seeking to comment in our letters-to-the-editor section are asked to read at least the following past *Creation/Evolution* articles:

- "The Bombardier Beetle Myth Exploded" by Christopher Gregory Weber (III)
- "Why Creationism Should Not Be Taught as Science—Part 2: The Educational Issues" by Frederick Edwords (III)
- "The Bombardier Beetle Shoots Back" by Robert E. Kofahl (V)
- "Response to Dr. Kofahl" by Christopher Gregory Weber (V)
- "Are There Human Fossils in the 'Wrong Place' for Evolution?" by Ernest C. Conrad (VIII)
- "Creationist and Fundamentalist Apologetics: Two Branches of the Same Tree" by Robert M. Price (XIV)
- "The Role of 'Nebraska Man' in the Creation-Evolution Debate" by John Wolf and James S. Mellett (XVI)
- "Creationists and the Australopithecines" by Martin K. Nickels (XIX)
- "Creationists and the Pithecanthropines" by C. Loring Brace (XIX)
- "Creationists and Neandertal" by Ernest C. Conrad (XIX).

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Picking a Bone with Philosophers of Science

Laurie R. Godfrey and John R. Cole

Is science a value-free, "Dragnet" quest for "just the facts, ma'am," or is it an ideology or world view and, therefore, no more objective than any other belief system? How can scientific claims be evaluated? Are there right and wrong answers or merely value judgments and opinions? And what role does the personality of the scientist play in the march of scientific progress?

Creationists have now found a book that some claim demonstrates the fallibility of science and, in particular, of paleoanthropology. *Bones of Contention: Controversies in the Search for Human Origins* is a historical account of twentieth-century paleoanthropology—of the personalities of the major human-fossil hunters and the "bones of contention" that shaped their understanding of human prehistory. The book's author, Roger Lewin, editor of "Research News" for *Science* magazine, is a skillful and knowledgeable journalist with a Ph.D. in biochemistry from Liverpool University. He has intimate knowledge of the personalities and data involved, having written seven books on the subject of evolution (including three with Richard Leakey), as well as having covered newsworthy events in paleoanthropology for *Science* over a number of years. *Bones of Contention* is a highly readable antidote to dry, clinically detailed stories that portray scientists as impossibly "perfect" eunuchs. It consists largely of interviews with many of the leading lights of paleoanthropology in the English-speaking world. It is interpretive and thematically organized—not merely "gossip." And one of its main themes is that paleoanthropology is "storytelling."

Opening and closing with chapters on the nature of science, the book is structured in two-chapter dyads presenting first a controversy and then its resolution. These include the taxonomic status of the Taung child, the establishment and dethroning of *Ramapithecus* as the earliest human ancestor after the divergence of human and African ape lineages, the debate over the age of the KBS tuff and its

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associated fossil hominid, and the significance of "Lucy" (*Australopithecus afarensis*) in human evolution.

The book argues that a priori conclusions have played a major role in shaping the results of empirical research in paleoanthropology, and that paleoanthropologists are particularly susceptible to hero-saga storytelling and contentiousness. Rich in lively historical anecdotes, *Bones of Contention* is similar to Stephen Jay Gould's *Mismeasure of Man* in its focus on how unconscious biases dictate the results of empirical, presumably "objective" research. Lewin's book goes further, however, in suggesting that the various misinterpretations of *Ramapithecus* can be equated with Piltdown Man—a hoax!—and that paleoanthropology is, "within the province of ideology and religion, broadly defined" (p. 302, quoting leading anatomist and paleoanthropologist Matt Cartmill). So it is hardly surprising that this book has been well received by creationists; it inadvertently provides grist for their anti-evolution mill. "You often see what you expect to see," says Lewin, "and not what you don't" (p. 19).

Lewin endorses the conceit, currently popular among philosophers of science, that science is really "storytelling" or "mythmaking." However, buried deep near the end of his text (p. 318) is Cartmill's definition of myth as story *whether true or false*. Many readers will miss the subtlety and take *myth* to mean an invented story rather than one which is verifiable or falsifiable. And Lewin himself is not the relativist his "myth" theme suggests; with twenty-twenty hindsight in chapter after chapter, he establishes how once-powerful "wrong" ideas have been overthrown by heroes with "right" ideas. This is suspiciously similar to the notion of good old-fashioned, self-correcting, positivistic science. Is science mythical or logical? The author seems to support both opinions.

Because of this contradiction, *Bones of Contention* can be read very differently by different readers. Although Lewin details the historical brawls and exposes the brazen defenders of mistaken ideas, his book nevertheless reveals a stunning accumulation of knowledge concerning the course of human evolution. So, some people will read the book as a chronicle of how science operates to weed out wrong ideas (for example, Osmon, 1988), while others, including creationists, will read it as a cutting expose of paleoanthropology as fantasy. Still others, such as Colin Groves in the *Journal of Human Evolution* (1988), see the book as insightful journalism revealing the pitfalls of science in action, while Jon Marks, in the same volume (1988a), describes Lewin's interpretation of the history of paleoanthropology as "extremely whiggish, all characters being judged according to how like our own their views turn out to have been in retrospect" (p. 267).

Lewin portrays paleoanthropology as less objective than other sciences (such as his own field, biochemistry). His closing observation is that "all sciences are odd in some way, but paleoanthropology is one of the oddest" (p. 319). Ironically, the research of two of Lewin's "heroes"—molecular biologists Charles Sibley and Jon Ahlquist—purporting to clinch once and for all (and without fossils!) the debate

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over chimp-gorilla-human-orang relationships, is now under attack for some of the same reasons that Lewin uses to dismiss arguments based upon fossil evidence: a priori bias and failure at objectivity (Marks, 1988b).

Despite Lewin's damning portrayal of some scientists as dogmatists refusing to change their arguments despite overwhelming contradictory evidence, his quotations do not always support his own analysis. He portrays Elwyn Simons, the world-renowned paleontologist, as an indefatigable defender of the notion that *Ramapithecus* was a direct Miocene ancestor of *Australopithecus* and *Homo*. Simons is nevertheless quoted as saying, upon seeing new materials belonging to a Miocene hominoid genus closely related to *Ramapithecus*, "We all knew what that meant." What "that meant" was that this genus, *Sivapithecus*, and probably *Ramapithecus* as well are more closely related to the Asian orangutan than to either humans or African apes. Given this admission, Simons hardly qualifies as a bastion of dogmatic prejudice; at most, he merely held on too tightly and too long to the idea of *Ramapithecus* as a direct human predecessor. Lewin attributes this to wishful thinking and unconscious bias divorced from the data on which his argument hung. Simons sees it otherwise; his early interpretation of *Ramapithecus*, he says, was the best possible interpretation of the empirical data then available. His position changed as new empirical data rendered his hypothesis untenable. This is the way science is *supposed* to work.

It is true, of course, that the personalities of scientists affect the changing dogmas of science; that individuals—hating to be proven wrong—sometimes defend favorite positions too long; and that science cannot claim to be the paragon of "truth." But scientists do embrace the notion that hypotheses should be empirically tested and rejected if the evidence shows that they don't work. Self-criticism is the professed backbone of scientific ideology.

Science is neither value-free nor fact-free. Science is a human enterprise and, as such, can never be value-free. And although hypotheses may not always be inescapable conclusions *driven* by data—there are usually too many explanations available that could reasonably account for the same data—they still must at least be *nudged* by the data to be considered scientific. All explanations are not equal. Like science in general, paleoanthropology *is* storytelling, but it is not *merely* storytelling.

In *Betrayers of the Truth*, journalists William Broad and Nicholas Wade (1982) grapple with the same basic issues: the crippling power of a priori convictions, prejudice, and ambition in the practitioners of science versus the enlightening power of empirical hypothesis testing. Idealistic philosophical realists might portray science as objective, unencumbered by bias, and motivated solely by the search for truth, while cynical philosophical relativists might insist that objectivity never prevails in science; instead, one explanation is simply replaced by another, with no objective criterion guiding the choice of either one. Both views of science, in their extreme forms, are naive.

The authors of *Betrayers of the Truth* offer a third view. Scientists may work

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selfishly for their own aggrandizement, using whatever rhetorical techniques are most likely to be persuasive, but the "invisible boot" (the scientific analogue of economist Adam Smith's "invisible hand" that works to produce public good out of private greed) will kick out explanations that really don't work. Over time, the selfishness of individual scientists inadvertently works toward benefiting science as a whole. Individual motives need not be wholesome; methods need not be objective. But, despite any lack of objectivity in the process of science, objectivity seems to prevail in the long run.

Although *Bones of Contention* is a fascinating and factual—if contentious—account of the history of paleoanthropology, it will surely be misused by people who wish to portray the fact of human evolution itself as fancy. But Lewin could *not* have written a *Bones of Contention* about "creation science"—not because "creation science" lacks storytelling (it most certainly does not!) but because there are so few controversies there! There are precious few bones of contention among creationists and virtually no resolutions nudged by the discovery of new empirical evidence. Like the religion behind it, creationism seeks to be "the same—yesterday, today, and forever."

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Letters to the Editor

David MacDonald acknowledged a refreshingly broad spectrum of opinion in "The Flood: Mesopotamian Archaeological Evidence (XXIII, pp. 14–20) rather than only polarities. However, he went on to dismiss the middle ground as irrational, excessively biased, and dependent upon Sir Leonard Woolley's claims; the article nearly equated local or regional flood theorists with the faction that seeks the ark and demands most strata be attributed to a single year's deluge. Although bias may be inescapable, people between the extremes do adapt to continuing investigation and make tentative conclusions.

Woolley's correlation has been out of favor since the early 1940s among most advocates of the Mesopotamian flood interpretation, none of whom would urge an equivalent to the "Mount Ararat" expeditions (which are based upon the latest traditional landing site, never specified in Genesis). MacDonald's quotations from Parrot and Kramer to indicate that critical abilities were overridden by presuppositions seem to me to suggest only their authors' conviction that effects should have causes—quite a scientific attitude. Some speculations appeal to unlikely causes—such as a short-term down-warping of southwestern Asia or winds blocking flood waters from drainage—but these are neither basic to the scenario nor pressed with confident confrontation, like typical pseudoscience.

An additional alluvial deposit deserves mention. Sir Max Mallowan discovered a two-meter "barren" level between Halaf and Uruk cultural zones at Ninevah containing thirteen beds alternating mud and sand. This may or may not correlate with the three-meter interval at two or more of Woolley's five Ur pits, though the latter deposit seems to represent a single inundation. Absence of alluvium elsewhere has suggested a very limited extent to each flood, but unconformities may have been missed by the archaeologists. Recorded evidence is too incomplete to tell whether any of the Mesopotamian deposits ought to be correlated with either the Genesis account or the somewhat parallel myths.

Uncertainty also prevails in biblical chronology and the relationship between various flood traditions. Massoretic text, Samaritan Pentateuch, and Septuagint provided literalists with flood year estimates of 2348 BCE, 4000 BCE, and 5872 BCE, respectively. An average could align with the earliest alluvial strata discovered by archaeologists, and the Garden of Eden might then match the first agriculture in Mesopotamia, but that remains a highly speculative interpretation. Scholars following the documentary hypothesis

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of Graf and Wellhausen have tended to assume that the biblical account derived from the Sumerian myths, though these may not be older, let alone ancestral; all may have a common ancestry or independent origins. MacDonald's assumption that Sumerian oral tradition never existed—so that flood stories only began within later, historical times—seems to be an unwarranted inference from lack of known tradition.

Sumerian civilization flourished during the post-glacial optimum or hypsithermal climatic interval. Rhodes Fairbridge traced a sea level rise to a maximum about six thousand years ago—a rise of between three and three and a half meters above the present level—and suggested that this peak accounted for flood stories. Near-Eastern climate, usually drier in Pleistocene warming trends and pluvial during stadials, had an anomalous subpluvial at the hypsithermal interval. Both factors could have contributed to inundation of the known world. Sumerian chalcolithic cultures had the technology to build a barge or boat. Genesis 5:29 may hint at a known benefit from floods, in reference to Noah's name: salt accumulations in the soil, from centuries of irrigation, were removed by floods, restoring agricultural potential. A regional flood interpretation fits available evidence, without demanding distortion of any scientific discipline; meanwhile, a great deal of mystery remains.

—John R. Armstrong

I do not believe my article, "The Flood: Mesopotamian Archaeological Evidence," should be read as implying that all local or regional flood theorists are to be equated in all matters. I attempt to show something quite different: that the middle ground is held "by a wide range of writers."

In general, I do not see much difference between John R. Armstrong's position and mine. I can with ease subscribe to his view that "recorded evidence is too incomplete to tell whether any of the Mesopotamian deposits ought to be correlated with either the Genesis account or the somewhat paralleled myths." I do, however, disagree with some of Armstrong's particular conclusions and with the methodological presuppositions behind them.

The quotations from Parrot and Kramer may seem to suggest to Armstrong only "that effects should have causes," but the quotations also reveal that Parrot and Kramer assumed without question that the cause of the flood story had to be an actual flood. That is the logical equivalent of assuming that the cause of the sixteenth-century witch mania was the existence of large numbers of real witches. Certainly, there must be cause or causes of the flood tale. I maintain, in Armstrong's own words, that "recorded evidence is too incomplete . . . to be correlated with either . . . account," and I offer an alternative hypothesis—that the endemic character of flooding in Mesopotamia is sufficient to have created the

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myth.

My article does, in fact, take into account Mallowan's discoveries at Nineveh, along with Mallowan's own dismissal of the idea that these levels could have anything to do with the Mesopotamian flood tradition (see my reference to Mallowan, 1964, in XXIII, p. 15).

Armstrong's attempt to average the three dates of the Massoretic, Samaritan, and Septuagint traditions seems methodologically unsound to me. There is no proof and little likelihood that any of them are derived from reliable chronologies, and they are by their very nature mutually exclusive. If one should be correct, the others by definition must be wrong. Moreover, averaging these divergent dates can no more be expected to yield an accurate date than averaging three different answers to a mathematics problem, at least two of which are certainly wrong, can be expected to yield an accurate answer.

My major disagreement with Armstrong stems from what we variously are willing to employ in attempting to write history. I agree with William of Occam that entities ought not be multiplied beyond necessity and with Stephen Jay Gould and others that hypotheses that cannot be tested are useless and uninteresting. Hence, in the *absence* of evidence of a highly developed Sumerian oral technique that would have preserved historical memories, I seek to exclude it from consideration. Armstrong seeks to include it because, presumably, there is no evidence that it did *not* exist.

Similarly, Armstrong suggests that certain post-glacial climatic variations "could have contributed to inundation of the known world" but produces no evidence that they in fact did. Until directly relevant evidence emerges, the hypothetical connection remains untestable and useless.

—David MacDonald

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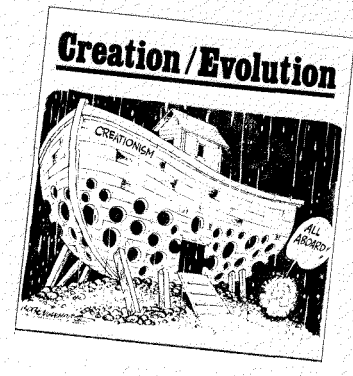

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